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14. ABSTRACT Researchers conducted 2 web-administered job analysis questionnaires (JAQ's) among Army combat engineers (Military Occupational Specialty [MOS] 12B). One JAQ addressed MOS-specific tasks, the other common soldiering tasks. Tasks were ranked in the following categories; most frequently conducted, most important to job, most time consuming, uniform most often worn and perceived expectations to perform task. Tasks rated as most important to job were often those reported as most frequently performed. Each task included a small to significant percentage of respondents reporting not having performed task in past 2 years. For both common and MOS-specific tasks, nearly 20% of respondents reported not performing over half the tasks. Expectations and task performance were substantially related. 12B's reported performing MOS-specific tasks much more often during combat deployments than in garrison settings. More differences than similarities were found between the tasks 12B's rated as important compared to 12B subject matter experts. Finally, 12B's identified three tasks not previously addressed.					
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USARIEM TECHNICAL REPORT T16-12

**RESULTS OF TWO USARIEM SELF-REPORT JOB ANALYSIS QUESTIONNAIRES
(JAQ'S) CONDUCTED WITH COMBAT ENGINEERS (MOS12B)**

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DISCLAIMERS

The opinions or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Army or the Department of Defense.

The investigators have adhered to the policies for protection of human subjects as prescribed in Army Regulation 70-25, and the research was conducted in adherence with the provisions of 32 CFR Part 219. Protocol # 9300.

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Portions of the data presented in this report have been previously reported.

Acronym List

AAR	after action reports
ACE	Armored Combat Earthmover
APOBS	Antipersonnel Obstacle Breaching System
BFV	Bradley Fighting Vehicle
HMMWV	High Mobility Multipurpose Wheeled Vehicle
IED	improvised explosive device
IET	initial entry training
JAQ	Job Analysis Questionnaire
MICLIC	mine clearing line charge
MOPMS	modular-pack mine system
MOS	military occupational specialty
MRAP	mine-resistant ambush protected
SME	subject matter expert
TRAC	TRADOC Analysis Center
TRADOC	Training and Doctrine Command
USARIEM	U.S. Army Research Institute of Environmental Medicine

Executive Summary

As part of a larger study conducted with the U.S. Army Training and Doctrine Command (TRADOC) to develop physical performance standards for seven of the Army's most physically demanding jobs (i.e., military occupational specialties, or MOS's), researchers from the U.S. Army Research Institute of Environmental Medicine (USARIEM) designed and conducted two web-administered job analysis questionnaires (JAQ's) among Army combat engineers (the occupation of combat engineer in the Army is classified as the 12B MOS). All 8,175 Army combat engineers were invited to participate in these two surveys. A total of 753 combat engineers responded to the first JAQ, which addressed job-related tasks specific to the 12B MOS (hereafter referred to as "12B-specific tasks"). Of these 753 respondents all but one were male; 66% had been in the Army for at least seven years, and 85% had achieved the rank of E5 (i.e., Sergeant) or higher. Sixteen percent were under 25 years of age, and 31% were at least 35 years old. Ninety-five percent had been deployed at least once, and 52% had been deployed three times or more.

The second JAQ addressed tasks that are generally performed not only by combat engineers but by enlisted Soldiers in many Army MOS's (hereafter referred to as "common tasks"). A total of 310 combat engineers responded to this second questionnaire. Of these 310 participants all were male; 66% had been in the Army for at least seven years, and 86% had achieved the rank of E5 or higher. Sixteen percent were under 25 years of age, and 30% were at least 35 years old. Ninety-four percent had been deployed at least once, and 54% had been deployed three times or more. Among the respondents to the second survey there may be some who also responded to the first survey; the researchers had no way of knowing how many participants responded to both surveys. The respondents to each of these two surveys indicated that they were willing to participate in completing the respective questionnaires as representatives of their branch. By applying an inclusion criterion that 50% or more of the survey items were required to be completed by each included participant, the number of respondents in the final datasets of the first and second questionnaires were reduced to 595 and 258, respectively.

Most Frequently Conducted Tasks

Of the 27 total tasks addressed in the Task Ratings sections of the two combined JAQ's for the 12B MOS, ANOVA's and post-hoc statistics indicated that seven tasks were reported as being performed more frequently than others (the complete list of tasks is provided in Tables 1 and 2). These seven tasks, ranked in order of descending reported frequency, are i) performing a dismounted foot march or tactical movement, ii) pounding U-shaped pickets using a picket pounder, iii) carrying rolls of concertina wire or barbed wire while constructing obstacles, iv) stretching concertina/barbed wire across pickets and attaching with wire ties with assistance from another Soldier, v) using a PSS Mine Detector (or similar device) to scan for land mines, vi) lifting and dragging a casualty to a safe location as quickly as possible, and vii) using a shovel or entrenching tool to fill sand bags when preparing to build a fighting position.

Most Important Tasks to the Job

Of the same 27 tasks referred to above, seven were reported to be the most important to success as an Army combat engineer. These seven tasks, ranked in order of descending reported importance, are i) Lifting and dragging a casualty to a safe location as quickly as possible, ii) performing a dismounted foot march or tactical movement, iii) pulling a casualty from a commander's seat and through the top hatch of a vehicle (i.e., a Bradley Fighting Vehicle (BFV) or Stryker) with help from another Soldier, iv) using a PSS Mine Detector (or similar device) to scan for land mines, v) pounding U-shaped pickets using a picket pounder, vi) carrying rolls of concertina wire or barbed wire while constructing obstacles, and vii) stretching concertina/barbed wire across pickets and attaching with wire ties with help from another Soldier.

Most Time Consuming Tasks

Of the same 27 tasks, seven were reported to take the most time to complete. Ranked in order of descending reported time needed for completion, these seven tasks are i) performing a dismounted foot march or tactical movement, ii) lifting, carrying and assembling components of the volcano mine system (i.e., beams, tripod assemblies, launcher racks) with assistance, iii) with help from another Soldier,

lowering the Modular-Pack Mine System (MOPMS) from a truck and then lifting and carrying it to the employment site, iv) carrying an Antipersonnel Obstacle Breaching System (APOBS), v) lifting and carrying the Bailey bridge rocking roller template or bridge bearing by themselves, vi) lifting and carrying the Bailey bridge rocking roller with help from another Soldier, and vii) using a PSS-14 mine detector (or similar device) to scan for land mines.

Other Notable Findings

In summary, the tasks rated as most important to job success are to a large extent those reported as the most frequently performed. However, there were some inconsistencies. Two of the common tasks (i.e., with assistance from another Soldier, lift, carry and install the barrel of a 25mm gun onto a BFV; and with the assistance of another Soldier, pull a casualty from a commander's seat and through the top hatch of a vehicle (i.e., BFV or Stryker)) were reported as being more important to job success but performed less often than others. Another common task (i.e., using a shovel or entrenching tool to fill sand bags when preparing to build a fighting position) was indicated as being less important but more frequently performed.

Several other findings are also noteworthy and may have important ramifications for training programs. First, for each task included in one of the two JAQs, a small to significant percentage of the respondents reported not having performed that task in the last two years – some not in their Initial Entry Training (IET). Second, expectations and task performance were related. That is, those who said they were expected to perform a task when the situation arises were more likely to report actually having completed the task in the last two years. Third, a number of Soldiers who had deployed reported that they had performed combat engineering tasks in the field but not in garrison. Fourth, several important tasks inherent to the combat engineer MOS were performed, as a whole, much more often during combat deployments than in garrison or training settings. Fifth, more differences than similarities were found between the tasks combat engineers rated as important to success in their MOS and those noted as important to the 12B MOS by a panel of subject matter experts (SMEs). Those in the SME group had

served a minimum of 12 of the last 24 months in at least a mid-level combat engineer position, in TRADOC) for at least one year, and had deployed within the last three years.

Finally, three broad areas of physically exerting tasks not addressed in the two JAQ's were identified as important in the comments of the respondents. These were: 1) Carrying equipment not mentioned in the survey (e.g., the bangalore, the mine clearing line charge (MICLIC), and the Thor III - a precision frequency jamming system used to neutralize the threat of improvised explosive devices), 2) route clearance using some of the same equipment (i.e., the bangalore and the MICLIC), and 3) breaching obstacles using some of the same equipment along with other tools.

Introduction

As part of a larger study conducted with the U.S. Army TRADOC to develop physical performance standards for seven of the Army's most physically demanding jobs, researchers from USARIEM and Human Performance Systems, Inc. designed two web-administered JAQ's to be completed by Army combat engineers (MOS 12B). These questionnaires were emailed to all 8,125 Army combat engineers by the TRADOC Analysis Center (TRAC) (the point of contact for this mailing was Dr. Jennifer Jebo) with a completion date of 5/01/2014.

Methods

The physically demanding tasks represented in the two JAQ's administered in this study were identified by a job analysis, which was guided by a scientific review panel and a senior personnel working group. These two groups oversaw the scientific process of the job analysis and the development of initial task lists, respectively. The process of developing these lists was initiated using the instructions in Department of the Army Pamphlet 611-21. The current physical demands and DA Form 5643 (The Physical Demands Analysis Worksheet) were used to initially define the essential tasks. The concept was to update the existing physical demands based on lessons learned from a decade of conflict. The experts examined the information in DA PAM 611-21, identified the tasks represented therein, determined if the list was current and complete, and created specific standards for each of the tasks. This was an iterative process with oversight provided by the Army TRADOC and experienced senior leaders in the 12B MOS.

Following this process determinations were made concerning whether adjustments to the physical demands of each task were needed. These decisions were based on data from the Center for Army Lessons Learned, after action reports (AAR) from recently deployed brigade combat teams, and interviews with recently deployed battalion- and company-level leaders and Soldiers. These experts were asked to provide information concerning whether a task was critical, how often it was performed, and any

additional quantifiable information. The lists of tasks and standards were then peer-reviewed by selected battalion commanders, command sergeants major, and non-commissioned officers in each MOS who were not affiliated with TRADOC. Each member of this branch peer review panel had been deployed, and many had been recently deployed. The final products were submitted to TRADOC by the senior personnel working group. These products were the task lists, the standards, and the supporting justification for changes (including DA Form 5643), with the changes noted. The final lists of tasks and standards from each proponent branch were approved by both the TRADOC Commanding General (GEN Robert W. Cone) and the Command Sergeant Major (CSM Daniel A. Daily). These lists were then forwarded to the Sergeant Major of the Army's Board of Directors for review and approval. Upon approval of the tasks and standards, they were verified in the field at the request of GEN Cone. The definition of verification used was that 90% of a randomly selected population of Soldiers in each MOS should be able to successfully complete the task to standard.

The resulting two JAQ's administered to combat engineers in this study were designed to obtain information concerning a wide variety of job-specific (performed only by combat engineers) and non-job specific (i.e., regularly performed by Soldiers in other MOS's) tasks of the 12B MOS. These questionnaires were administered over the internet and responded to anonymously. No attempt was made to identify individual respondents. The first of these two JAQ's addressed job-related tasks specific to the 12B MOS (hereafter referred to as "12B-specific tasks;" see Table 1). The second JAQ addressed tasks which are regularly performed not only by combat engineers but by enlisted Soldiers in many Army occupations (hereafter referred to as "common tasks;" see Table 2). Both JAQ's were divided into three major sections: 1) Demographic information (e.g., age, race, deployment history); 2) individual tasks, asking for (a) the frequency with which the respondent performed each task, (b) the importance of each to job success, (c) the time needed to complete each task, (d) whether the respondent was actually expected to perform each task when the situation required it, and (e) what uniform was typically worn while

completing each task; and 3) “supplemental information” to obtain a fuller picture of some of the tasks addressed in the previous section.

A total of 753 of the 8,175 combat engineers who were willing to participate as representatives of their branch provided data for the first JAQ, for a response rate of 9.22%. A total of 310 – a response rate of 3.8% - provided data for the second JAQ. Among the respondents to the second survey there may be some who also responded to the first survey; the researchers had no way of knowing how many participants responded to both surveys. By applying an inclusion criterion that 50% or more of the survey items needed to be completed by each included participant (excluding questions asking for some type of demographic data such as gender or ethnic group), the numbers of respondents in the two final datasets were reduced to 595 and 258 respectively.

Table 1. Combat engineer (i.e., 12B) tasks included in the first JAQ

- 1) Carry an APOBS
- 2) Lift and carry H6 Cratering Charges from a stockpile location to an emplacement area
- 3) With assistance from another Soldier, lower the MOPMS from a truck, then lift and carry it to the employment site
- 4) With the assistance of another Soldier, lift and carry the Bailey Bridge Rocking Roller
- 5) Lift and carry the Bailey Bridge Rocking Roller Template or Bridge Bearing by yourself
- 6) As part of a six (6) Soldier team, lift, carry, and emplace a Bailey Bridge panel
- 7) Pound U-shaped pickets using a picket pounder
- 8) Carry rolls of concertina wire or barbed wire while constructing obstacles
- 9) With the assistance of another Soldier, stretch concertina/barbed wire across pickets and attach with wire ties
- 10) Perform grappling with a grappling hook to clear booby traps/antipersonnel devices from an obstacle by throwing the hook, dropping to the ground, and pulling the hook back to your position
- 11) Use a PSS-14 Mine Detector (or similar device) to scan for land mines
- 12) With assistance, lift, carry and assemble components of the volcano mine system (i.e., beams, tripod assemblies, launcher racks)

Table 2. Common tasks included in the second JAQ

- 1) Lift and drag a casualty to a safe location as quickly as possible
- 2) With assistance from another Soldier, lift, carry, and install the barrel of a 25mm gun onto a BFV
- 3) Lift and carry ammunition cans from the supply point (e.g. ammunition center or truck) to the back of a BFV
- 4) Throw a hand grenade
- 5) Use a shovel or entrenching tool to fill sand bags when preparing to build a fighting position
- 6) Lift and carry sandbags to an emplacement location and build a fighting position
- 7) With the assistance of another Soldier, pull a casualty from a commander's seat and through the top hatch of a vehicle (i.e., BFV or Stryker)
- 8) Climb over, through, or around barbed wire obstacles
- 9) With a group of Soldiers, lift, carry and connect a vehicle tow bar for a Buffalo, BFV or Stryker from a towing vehicle to the disabled vehicle
- 10) Jack up a vehicle and remove lug nuts from a flat tire
- 11) With the assistance of another Soldier, remove a spare tire from a HMMWV, roll into place, and lift onto the axle of the disabled vehicle
- 12) Manually tighten the lug nuts on a tire with a lug or torque wrench
- 13) As part of a group of four Soldiers, remove the flat tire from a HMMWV, then roll and lift it into the back of a vehicle
- 14) Perform a dismounted foot march or tactical movement
- 15) While seated, remove and lift/lower the M242 Feeder assembly from the 25mm gun on a BFV during maintenance and/or remedial action misfire procedures

Analysis

The analysis plan for this study was to use the simplest and most straightforward analyses available that would provide decision makers with helpful information. A central tenet of this plan was to display all the data rather than selected subportions of it. So for example, when highlighting a particular feature of any set of variables (e.g., those tasks rated as most frequently performed or most important to job success), the ratings (e.g., the frequency or importance ratings) are provided for all the variables in that set along with specifying the particular highlighted rankings or features. Frequency analysis was used to obtain descriptive information, and chi-square tests and phi-coefficients, t-tests, Mann-Whitney U tests, and analyses of variance (ANOVA) with accompanying Duncan post-hoc tests were used for group comparisons. Mann-Whitney U tests were used specifically when one or more distributions of variables being compared were highly aberrant (i.e., deviated to a large extent from normal) or when this type of test was more suitable based on the item response categories.

Results

Section 1: Background Information (i.e., Demographics)

Demographic data for both the sample completing the 12B-specific task JAQ (i.e., the 595 combat engineers who responded to the JAQ addressing 12B-specific tasks) and the sample responding to the Common Task JAQ (i.e., the 258 “12B’s” who completed the JAQ addressing tasks performed by both combat engineers and Soldiers in other MOS’s) are displayed in Table 3. Considering the combined sample from both surveys, nearly 100% (all but one) were male. Eighty-two percent were Caucasian, 12% were African-American, 3% were Asian, and 2% indicated being native Hawaiian or another type of Pacific Islander. Fourteen percent indicated that they were of Hispanic or Latino ethnicity. Sixteen percent of the sample was under 25 years of age and 27% were 35 or older. Nearly the entire sample (96%) indicated that they had deployed to a foreign country and 54% said they had been deployed three times or

more. Seventy-four percent had deployed to Afghanistan and 72% had deployed to Iraq. Forty-eight percent of the sample had served in both these theaters of operation.

Table 3. Demographic data for the samples of 12B's completing the job-specific and Common Task JAQ's

<u>Variable</u>	<u>12B-Specific JAQ Sample¹</u>		<u>Common Task JAQ Sample¹</u>	
<u>Gender</u>				
Male	n = 593	592 (99.8%)	n = 256	256 (100%)
Female		1 (0.2%)		-----
<u>Ethnic Background</u>				
Hispanic or Latino	n = 557	73 (13.1%)	n = 240	38 (15.8%)
Not Hispanic or Latino		484 (86.9 %)		202 (84.2 %)
<u>Race</u>				
Caucasian	n = 530		n = 223	188 (84.3%)
African American		434 (81.9%)		30 (13.5%)
Asian (Chinese, Philippino, Japanese, Korean, etc.)		63 (11.9%)		1 (0.4%)
Native Hawaiian or other Pacific Islander		22 (4.2%)		4 (1.8%)
		11 (2.1%)		
<u>Age</u>				
Under 25	n = 595	94 (15.8%)	n = 215	35 (16.3%)
25 to 30		210 (35.3%)		76 (35.3%)
31 to 40		246 (41.3%)		87 (40.5%)
Over 40		45 (7.6%)		17 (7.9%)
<u>Rank</u>				
PV2 & PFC (E2 & E3)	n = 585	23 (3.9%)	n = 255	11 (4.3%)
SPC or CPL (E4)		61 (10.4%)		24 (9.4%)
SGT (E5)		136 (23.2%)		60 (23.5%)
SSG (E6)		188 (32.1%)		93 (36.5%)
SFC (E7)		177 (30.3%)		67 (26.3%)
<u>Tenure in the Army</u>				
Less than 18 months	n = 595	23 (3.9%)	n = 256	11 (4.3%)
18 months to 3 years		44 (7.4%)		21 (8.2%)
4 to 6 years		134 (22.5%)		54 (21.1%)
7 to 10 years		154 (25.9%)		65 (25.4%)
11 or more years		240 (40.3%)		105 (41.0%)
<u>Times Deployed Since 11 SEP 2001</u>				
0	n = 595	24 (4.0%)	n = 257	13 (5.1%)
1		95 (16.0%)		35 (13.6%)
2		158 (26.6%)		68 (26.5%)
3		155 (26.1%)		74 (28.8%)
4		109 (18.3%)		44 (17.1%)
5 or More		54 (9.0%)		23 (8.9%)

¹ Percentages for some of the demographic variables do not sum exactly to 100% due to rounding.

Table 3. Continued

<u>Variable</u>	<u>12B-Specific JAQ Sample¹</u>		<u>Common Task JAQ Sample¹</u>	
<u>Tenure in current MOS (n's = 592)</u>	n = 592			
Less than 18 months		23 (3.9%)		
18 months to 3 years		47 (7.9%)		
4 to 6 years		149 (25.2%)		
7 to 10 years		142 (24.0%)		
11 or more years		231 (39.0%)		
<u>Component (n = 258)</u>				
Active Army			n = 258	258 (100%)

¹ Percentages for some of the demographic variables do not sum exactly to 100% due to rounding.

Section 2: 12B-Specific Task Ratings

In the following pages, the results are summarized in terms of

- how often each 12B-specific task was performed in the last two years,
- extent to which each task in the job-specific JAQ was expected to be performed,
- rated importance of each 12B-specific task,
- rated time each 12B-specific task takes to perform, and
- uniforms worn for each 12B-specific task.

2.1. How Often Each 12B-Specific Task Was Performed in the Last Two Years

Tasks with the same ranking numbers (i.e., with the same number on the far left in the chart title) do not differ statistically from each other. So for example, in Figure 1, all the tasks numbered “1” were reported to have been performed at about the same rate of frequency.

Figure 1. Frequencies with which 12B-specific tasks were performed in the last two years

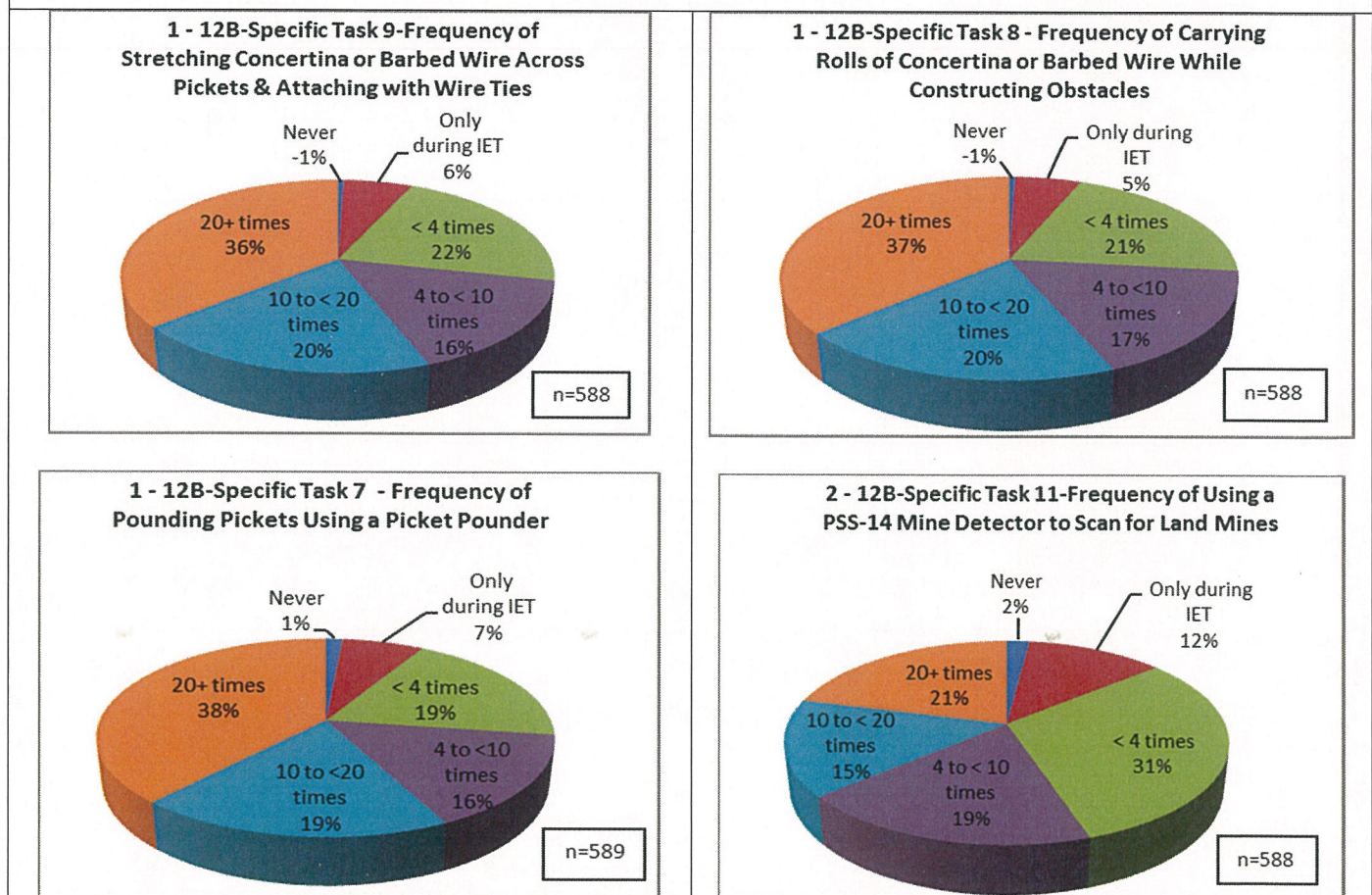
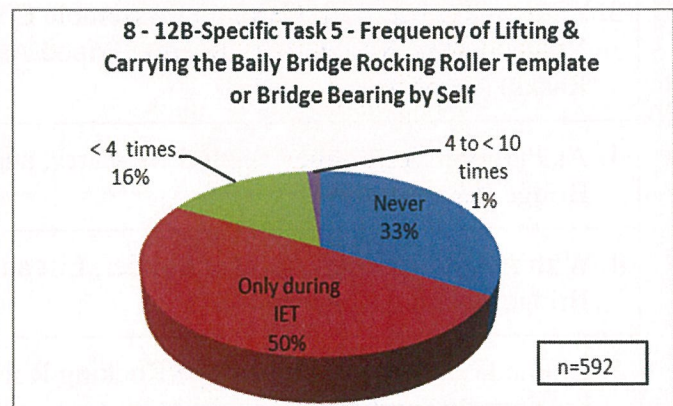
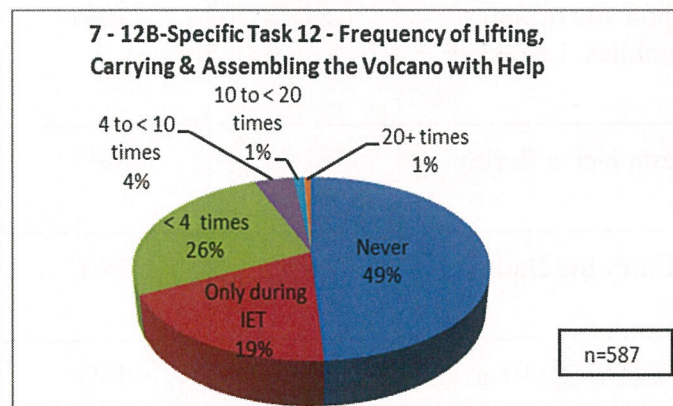
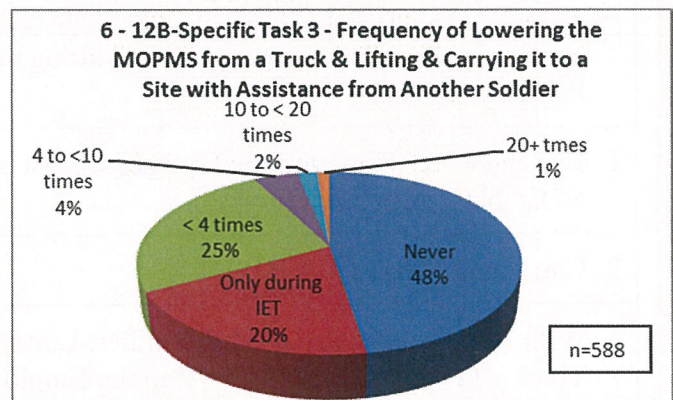
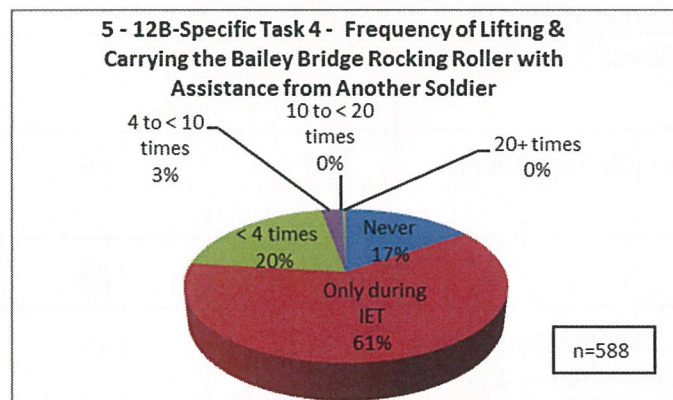
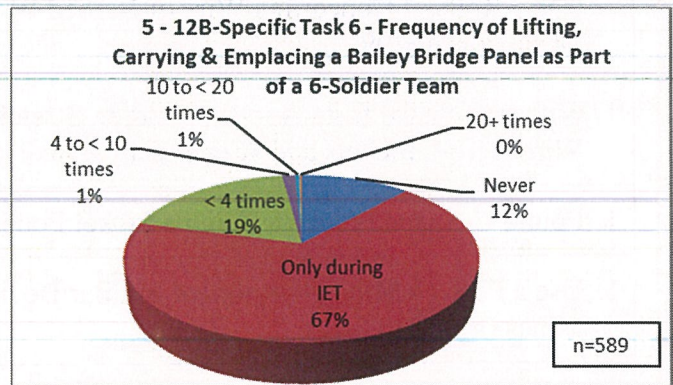
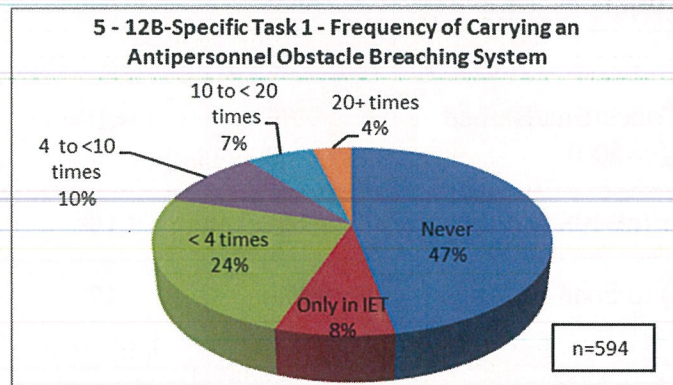
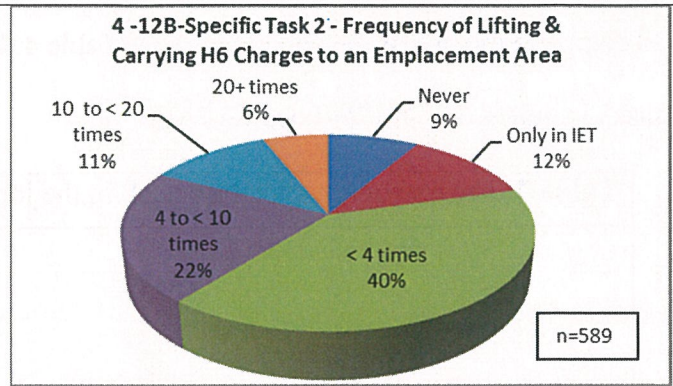
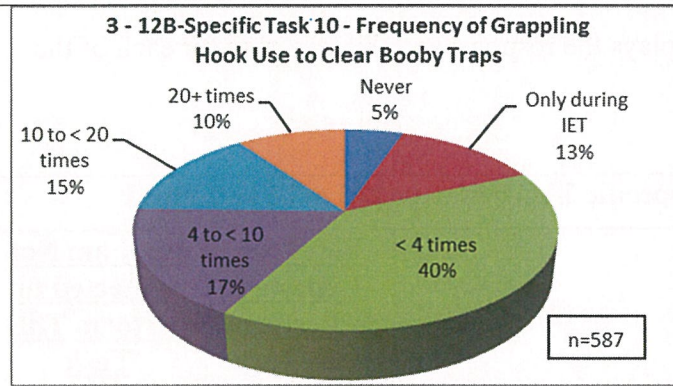


Figure 1. Continued



For each of the tasks represented by the JAQ, respondents were asked whether they were expected to complete the task if the situation arises. Table 4 displays the responses to this question for each of the tasks included on the 12B-Specific JAQ.

Table 4. The extent to which each task in the job-specific JAQ was expected to be performed		
<u>Task</u>¹	<u>Yes, I am Expected to Perform This Task</u>	<u>No, I am Not Expected to Perform This Task</u>
1. Carry Rolls of Concertina Wire or Barbed Wire While Constructing Obstacles (n=499)	100%	0%
1. With Assistance from Another Soldier, Stretch Concertina/Barbed Wire Across Pickets and Attach with Wire Ties (n=500)	>99%	<1%
1. Pound U-Shaped Pickets Using a Picket Pounder (n=498)	99%	1%
1. Use a PSS-14 Mine Detector (or Similar Device) to Scan for Land Mines (n=499)	99%	1%
1. Perform Grappling with a Grappling Hook to Clear Booby Traps/Antipersonnel Devices from an Obstacle by Throwing the Hook, Dropping to the Ground, and Pulling the Hook Back to Your Position (n=497)	97%	3%
1. Lift and Carry H6 Cratering Charges from a Stockpile Location to an Emplacement Area (n=486)	97%	3%
2. Carry an APOBS (n=498)	88%	12%
3. With Assistance from Another Soldier, Lower the MOPMS from a Truck and then Lift and Carry It to the Employment Site (n=488)	82%	18%
3. With Assistance, Lift, Carry and Assemble Components of the Volcano Mine System (i.e., Beams, Tripod Assemblies, Launcher Racks) (n=499)	81%	19%
4. As Part of a Six-Soldier Team, Lift, Carry, and Emplace a Bailey Bridge Panel (n=499)	67%	33%
4. With Assistance from Another Soldier, Lift and Carry the Bailey Bridge Rocking Roller (n=487)	66%	34%
5. Lift and Carry the Bailey Bridge Rocking Roller or Bridge Bearing by Yourself (n=499)	56%	44%

¹ The numbers of subjects who answered each particular item are listed at the end of each item.

2.2. Rated Importance of Each 12B-Specific Task

Tasks with the same ranking numbers (i.e., with the same number on the far left in the chart title) do not statistically differ from each other. So for example, in Figure 2, all the tasks numbered “1” are rated at about the same level of importance.

Figure 2. The rated importance of 12B-specific tasks performed in the last two years

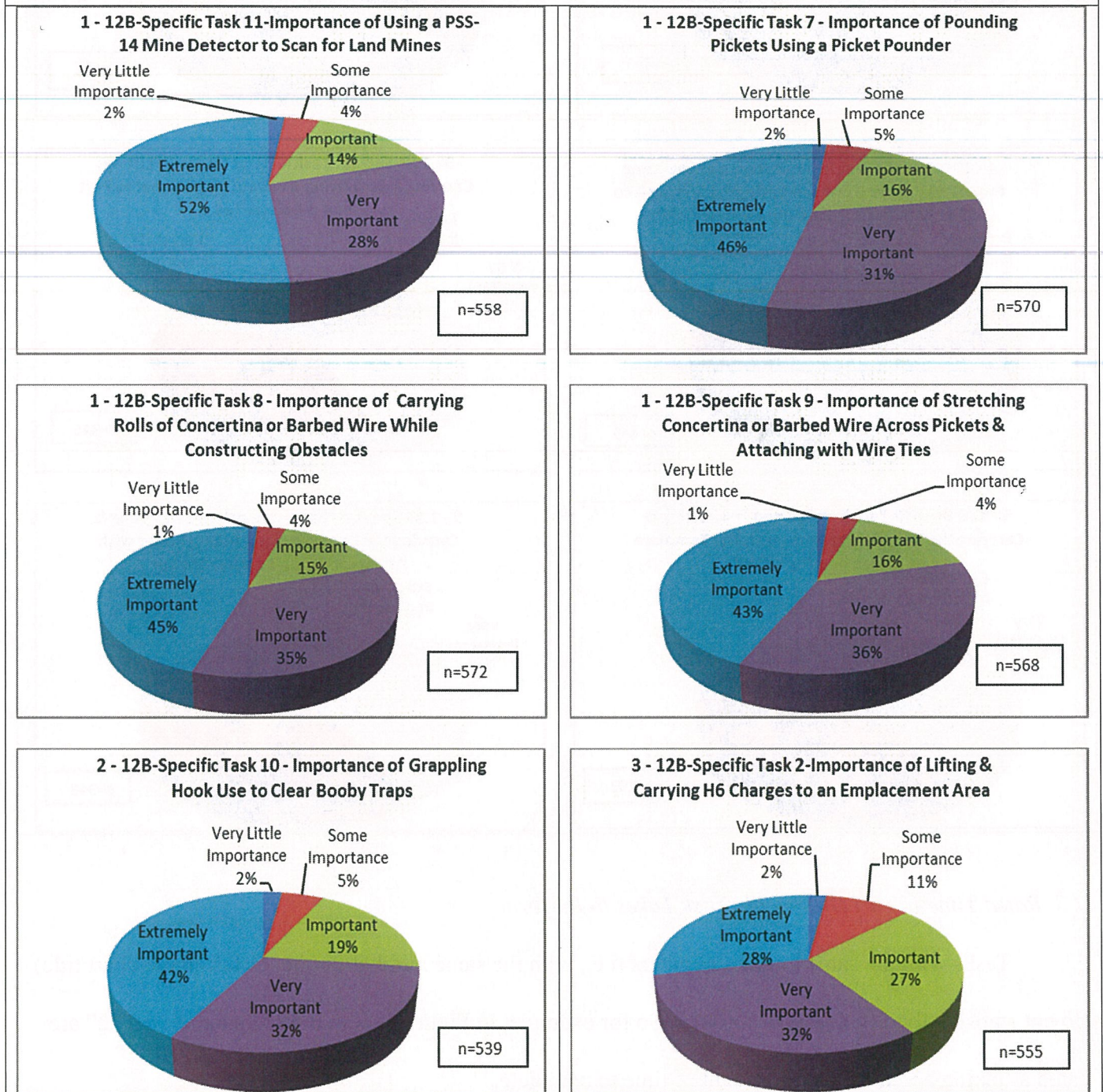
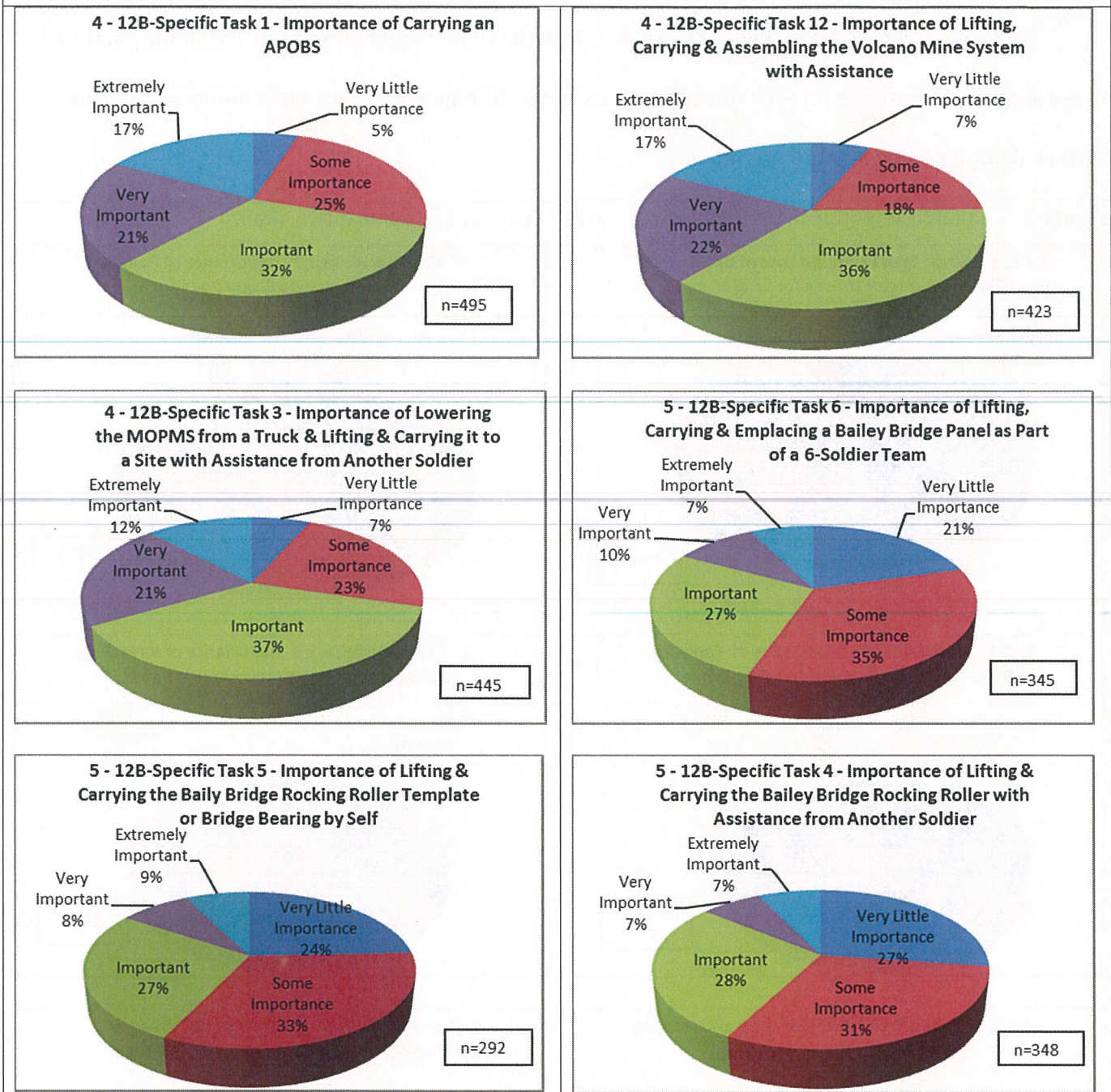


Figure 2. Continued



2.3. Rated Time Each 12B-Specific Task Takes to Perform

Tasks with the same ranking numbers (i.e., with the same number on the far left in the chart title) do not statistically differ from each other. So for example, in Figure 3, both the tasks numbered “2” are rated as taking about the same amount of time to complete.

Figure 3. Time needed to conduct 12B-specific tasks performed in the last two years

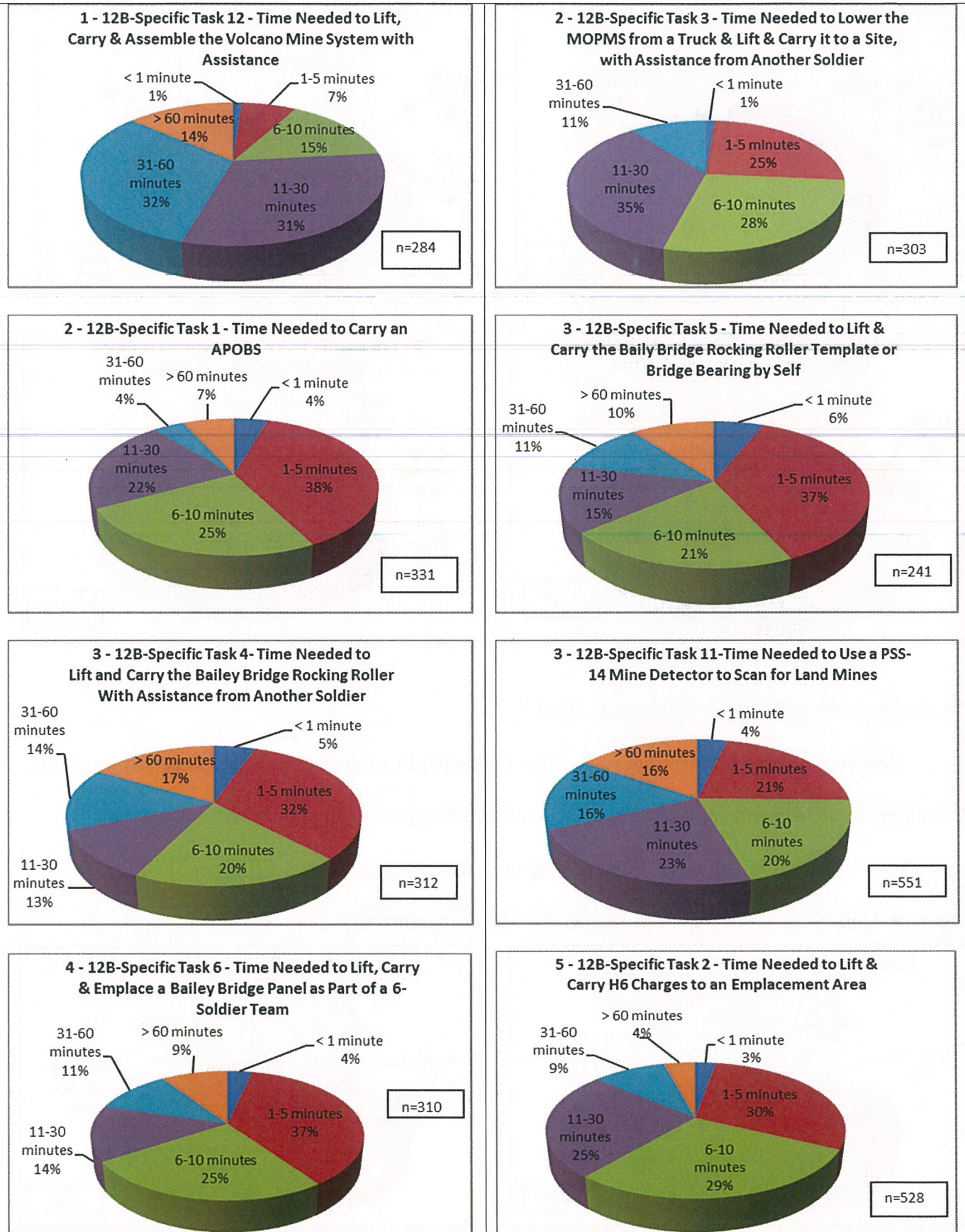
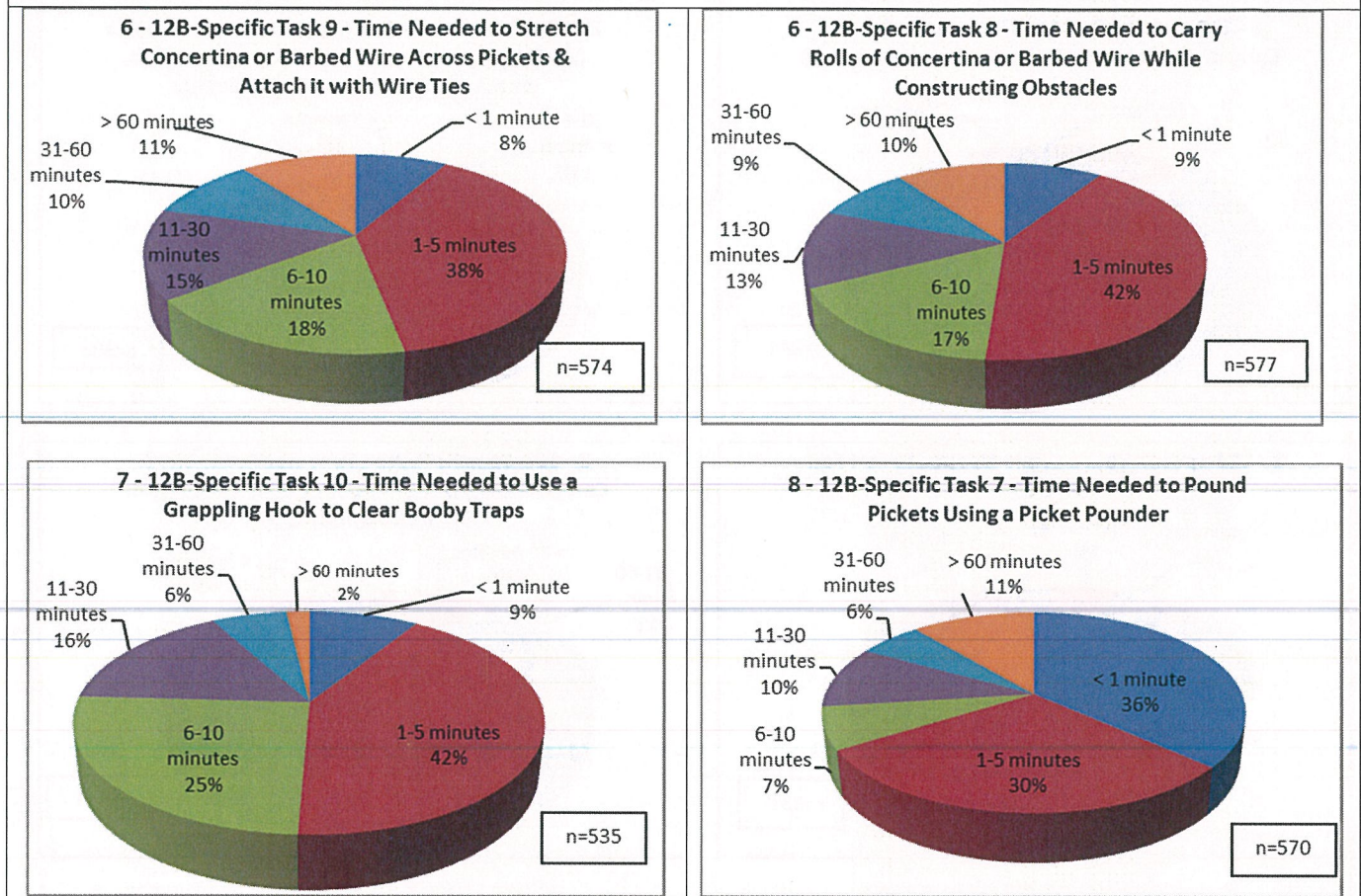


Figure 3. Continued



2.4. Uniforms Worn for Each 12B-Specific Task

Response options for these questions were 1) Standard Uniform, 2) Standard Uniform with Vest, 3) Fighting Load Minus Weapon, 4) Fighting Load with Weapon, 5) Approach March Load, and 6) Emergency Approach March Load. Figure 4 displays the responses for each 12B-Specific task.

Figure 4. Uniform worn to conduct 12B-specific tasks performed in the last two years

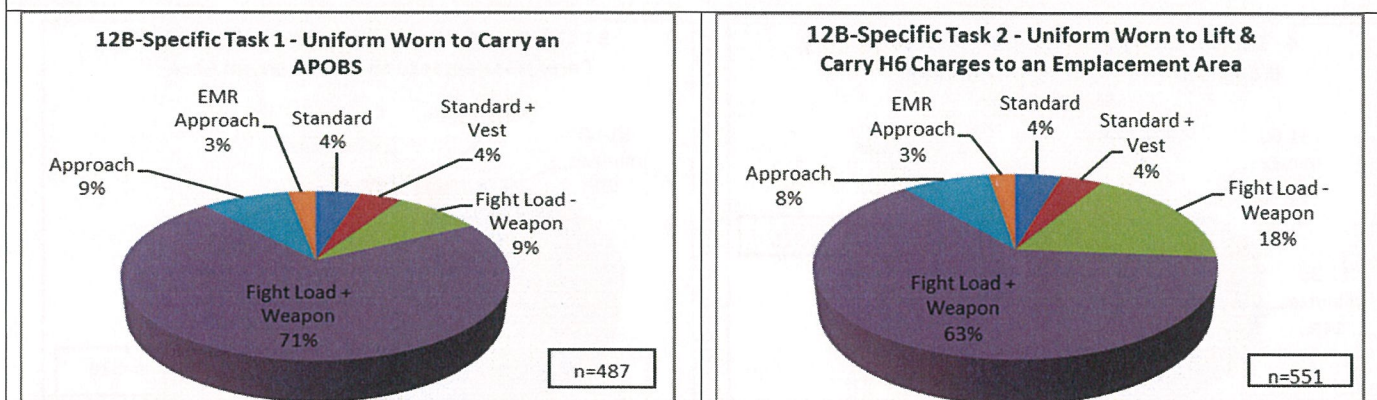
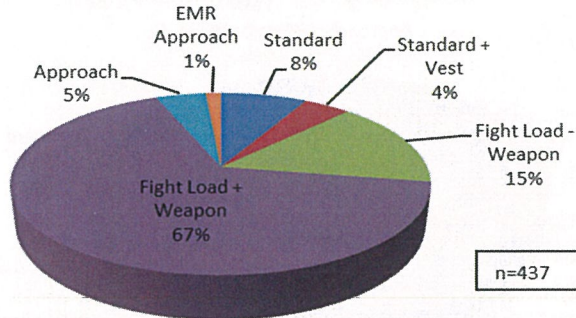
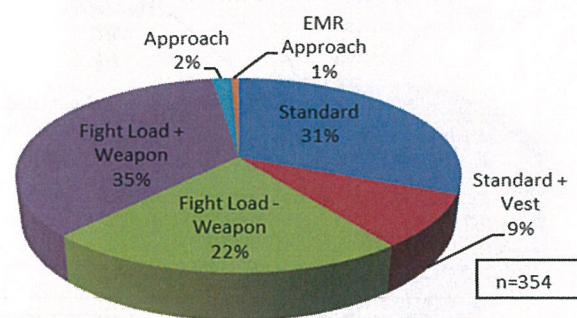


Figure 4. Continued

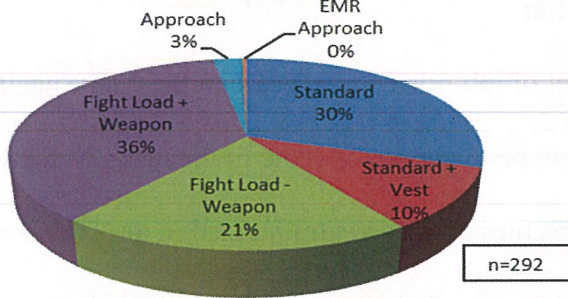
12B-Specific Task 3 - Uniform Worn to Lower the MOPMS from a Truck & Lift & Carry it to a Site with Assistance from Another Soldier



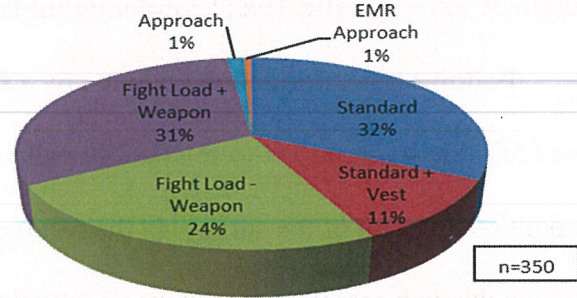
12B-Specific Task 4 - Uniform Worn to Lift and Carry the Bailey Bridge Rocking Roller With Assistance from Another Soldier



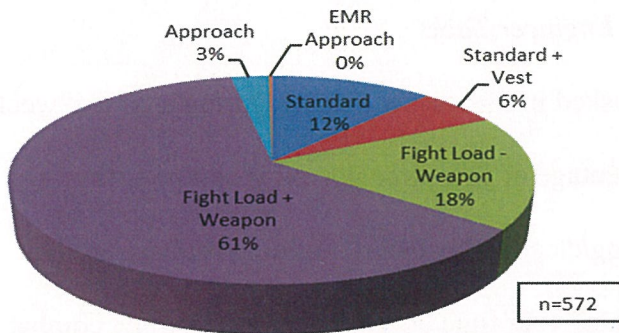
12B-Specific Task 5 - Uniform Worn to Lift & Carry the Bailey Bridge Rocking Roller Template or Bridge Bearing by Self



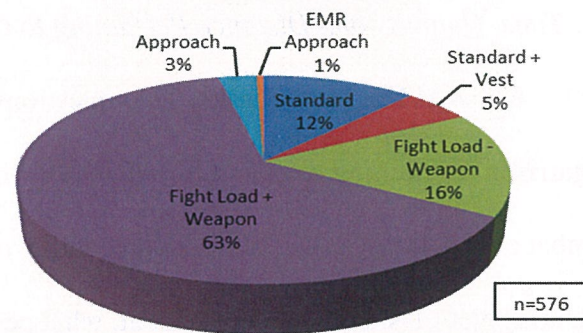
12B-Specific Task 6 - Uniform Worn to Lift, Carry & Emplace a Bailey Bridge Panel as Part of a 6-Soldier Team



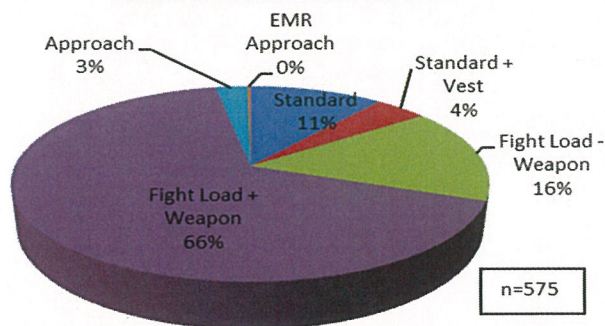
12B-Specific Task 7 - Uniform Worn to Pound Pickets Using a Picket Pounder



12B-Specific Task 8 - Uniform Worn to Carry Rolls of Concertina or Barbed Wire While Constructing Obstacles



12B-Specific Task 9 - Uniform Worn to Stretch Concertina or Barbed Wire Across Pickets & Attach it with Wire Ties



12B-Specific Task 10 - Uniform Worn to Use a Grappling Hook to Clear Booby Traps

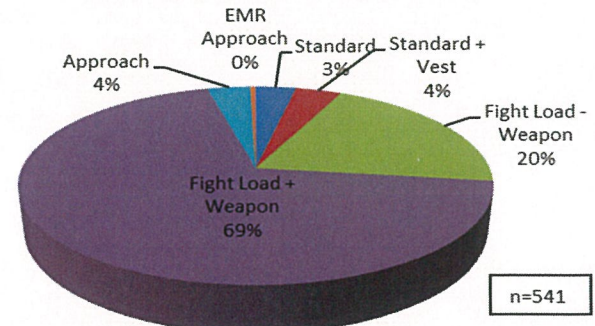
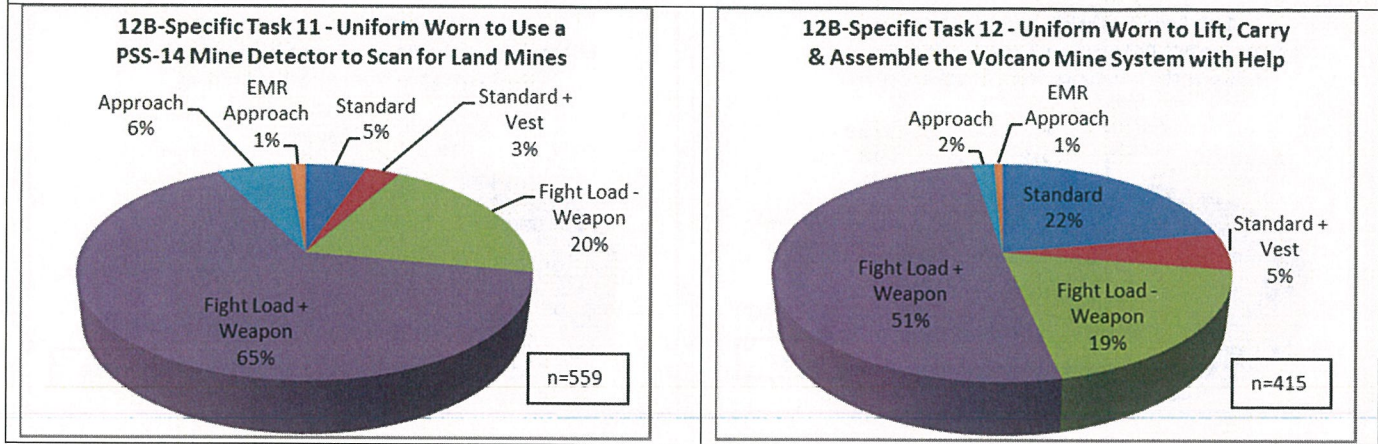


Figure 4. Continued



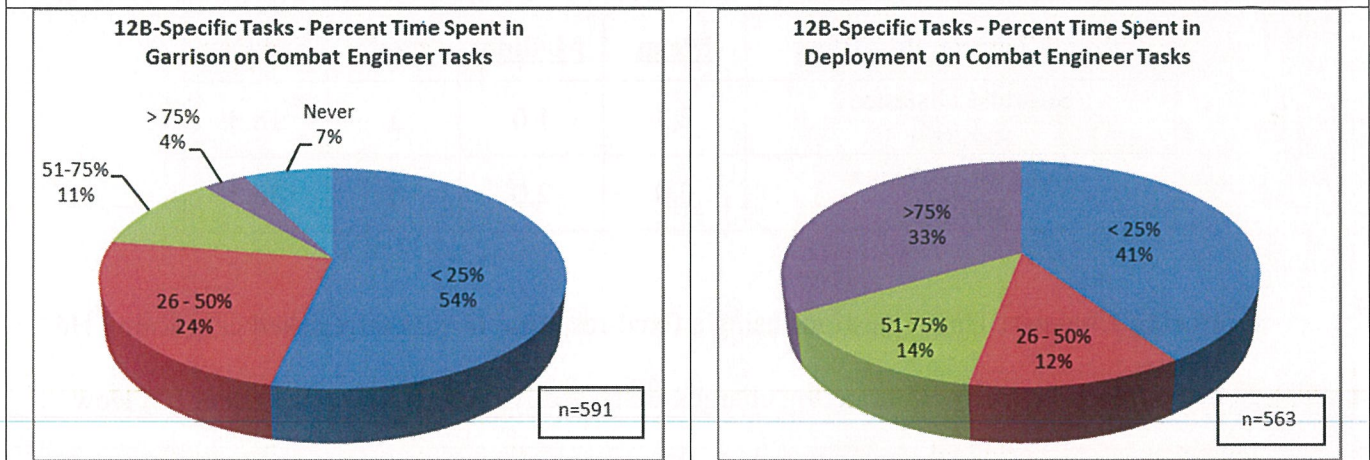
Section 3: 12B-Specific Task Supplemental Information

Following is information obtained by a second set of job-related questions on the 12B-Specific Task JAQ. These questions were asked to gain a more complete picture of some of the tasks addressed in the previous portion of the survey. In the following pages, the results are summarized in terms of the order in which the item topics appear in the questionnaire.

3.1. Time, Quantity and Distance Pertaining to Combat Engineer Tasks

Combat Engineer Tasks. Two questions were asked in this subsection: 1) During a typical week in garrison (or training weekend for AR/NG), what percentage of your time do you spend performing combat engineer tasks (i.e., obstacle breaching, emplacing/clearing obstacles, building bridges, etc.); 2) During your last combat deployment, what percentage of your time do you spend performing combat engineer tasks (listed as immediately above)? Figure 5 displays the responses to these two questions.

Figure 5. Percentages of time spent conducting 12B-specific engineer tasks in garrison vs deployment



APOBS. Three questions were asked in this subsection. The first of these questions, using a fixed-response format, asked the following: “How far (in miles) do you usually carry the Antipersonnel Obstacle Breaching System (APOBS)?” Figure 6 displays the responses to this question. Two additional questions were asked concerning the APOBS using an open response format. These questions were: 1) When you carried the APOBS, what is the shortest distance you carried it? 2) What is the longest distance you carried it? Table 5 summarizes the responses to these two questions.

Figure 6. Distances (miles) that combat engineers carried the APOBS

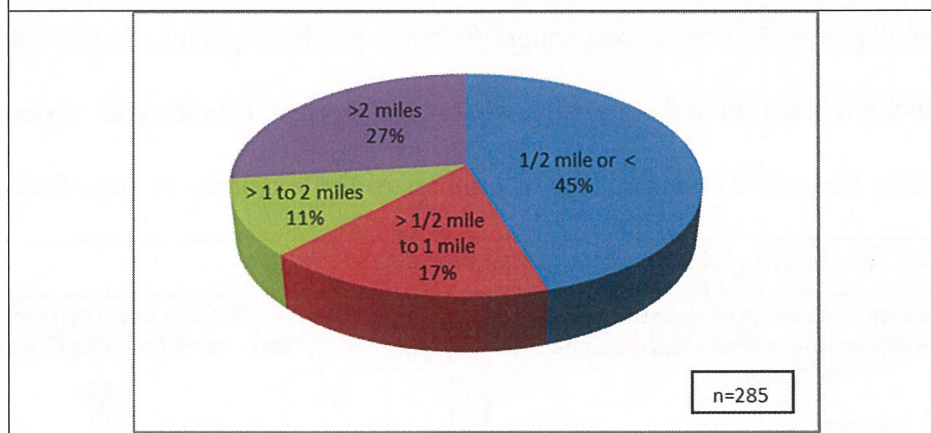


Table 5. Distances that combat engineers carried the APOBS				
<u>Task Distance (in Miles)</u>	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Shortest Distance (n=269)	2.3	1.0	1	18.3
Longest Distance (n=273)	6.0	2.0	1	36.3

Cratering Charges. Three questions using a fixed-response format were asked concerning H6 cratering charges: 1) How many H6 cratering charges are typically used to create one crater? 2) How many H6 cratering charges are you typically responsible for carrying from the stockpile location to the crater site for emplacement to create one crater? (Your response should reflect the total number of charges you have personally been responsible for moving to the crater site, regardless of the number of trips involved) and 3) How far do you usually have to carry the H6 cratering charges from the stockpile location to the emplacement site? Figure 7 displays the responses to these three questions. An additional four questions were asked pertaining to H6 cratering charges using an open response format: 4) When carrying H6 cratering charges from the stockpile location to the crater site for emplacement, what is the smallest number of charges you personally carried to create one crater? 5) What is the greatest number of charges you personally carried to create one crater? 6) When you have personally carried H6 cratering changes from a stockpile location to a crater site, what is the shortest distance you carried them? 7) What is the longest distance you carried them? Table 6 summarizes the responses to these four questions.

Figure 7. Usage of H6 cratering charges by combat engineers

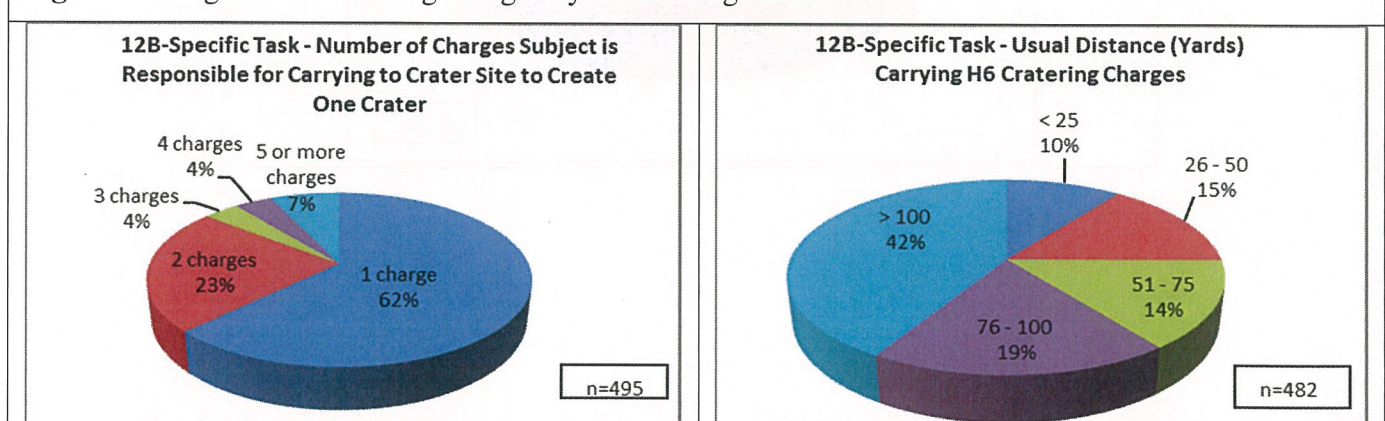


Table 6. Carrying H6 cratering charges: Quantities and distances carried from the stockpile location to the crater site

	<u>Task</u>	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Quantity of cratering charges carried to create one crater	Smallest number (n=485)	1.1	1.0	1	0.6
	Greatest number (n=483)	2.0	2.0	2	1.5
Total Distance (yds.)	Shortest distance (n=471)	83.2	50.0	50	199.0
	Longest distance (n=472)	424.7	150.0	100	1058.0

Bailey Bridge. Six questions were asked in this section. The first two questions, using a fixed-response format, asked: 1) Have you ever been involved in building a Bailey bridge? 2) When you were involved in building a Bailey bridge, how far (yards) did you usually carry the bridge components (e.g., Bailey bridge panels, rocking roller template, bridge bearing, and rocking roller)? Four hundred and ten, or 69.7%, of the 588 subjects who answered the first question said they had been involved in building a Bailey bridge. Figure 8 displays the responses to the second question. An additional four questions were asked pertaining to the Bailey bridge using an open response format: 3) When involved in building a Bailey bridge, what percentage of the time did you carry the Rocking Roller Template or Bridge Bearing by yourself? 4) What percentage of the time did you carry the Rocking Roller Template or Bridge Bearing as a member of a team? 5) When you were involved in building a Bailey bridge, what is the shortest distance you ever carried the bridge components? 6) What is the farthest distance you ever carried the bridge components? Table 7 summarizes the responses to these four questions.

Figure 8. Distances (yards) that combat engineers carried Bailey Bridge components

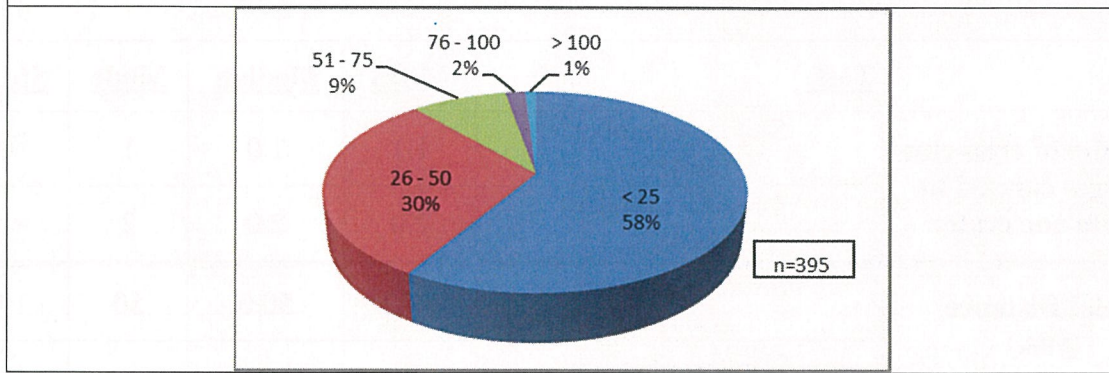


Table 7. Percentages of time and the distances the subject carried the Rocking Roller Template or Bridge Bearing

<u>Task Completion</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Percentage of time task completed solo or with a team	Unaccompanied (n=457)	13.2%	0.0%	0%	21.2%
	In a team (n=457)	71.1%	90.0%	100%	36.9%
Distance carried (yds.)	Shortest distance (n=379)	15.9	10.0	10	18.2
	Farthest distance (n=379)	46.9	30.0	50	48.8

Pickets: Six questions were asked in this section. The first two items using a fixed response format asked: 1) When pounding pickets to construct wire obstacles, how many pickets would you usually emplace before resting? 2) When you pounded pickets while constructing wire obstacles, how long (minutes) would you usually work before resting? Figure 9 displays the responses to these two questions. An additional four questions were asked pertaining to picket pounding using an open response format: 3) When pounding pickets to construct wire obstacles in the past, what is the smallest number you ever installed before resting? 4) What was the largest number you ever installed before resting? 5) When you pounded pickets to construct wire obstacles, what was the shortest time (in minutes) you worked before resting? 6) What was the longest time you worked before resting? Table 8 summarizes the responses to these four questions.

Figure 9. Usage of pickets by combat engineers – pounding before resting

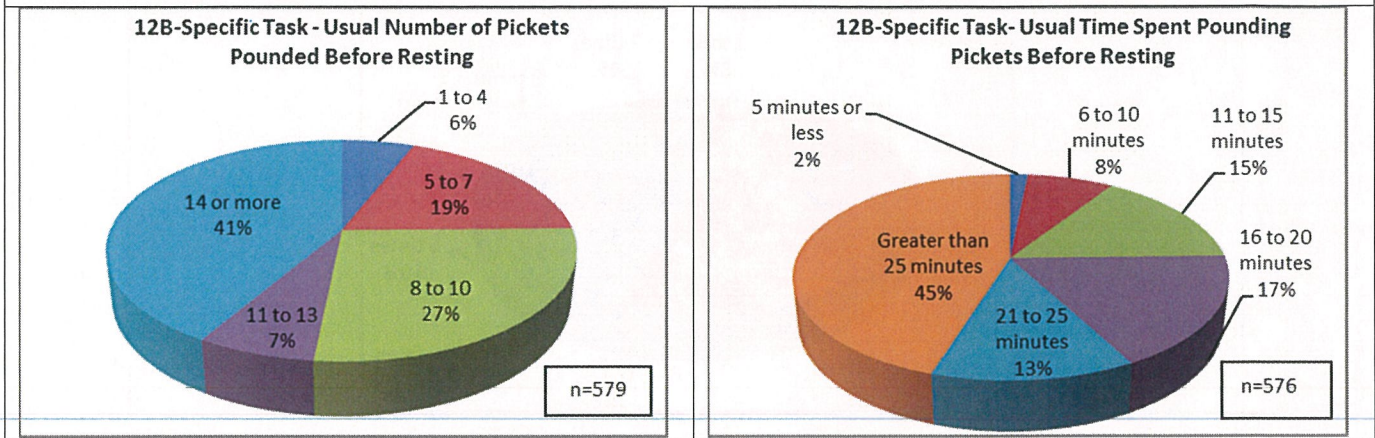


Table 8. Number of pickets installed and time worked before resting when pounding pickets to construct wire obstacles

<u>Task</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Number of Pickets	Smallest number (n=570)	9.5	5.0	5	18.9
	Largest number (n=569)	57.5	20.0	20	439.1
Time Worked Before Resting (in minutes)	Shortest time (n=559)	14.3	10.0	5	15.6
	Longest time (n=559)	57.6	45.0	60	65.6

Grappling Hook: Three questions were asked in this section. The first question used a fixed response format to ask: When performing grappling with a grappling hook, how many times did you usually throw the hook before resting? Figure 10 displays the responses to this question. The other two questions pertaining to grappling were asked using an open response format: 2) When you have performed grappling with a grappling hook in the past, what was the smallest number of times you threw the hook before resting? 3) What was the greatest number of times you threw the hook before resting? Table 9 summarizes the responses to these two questions.

Figure 10. Usage of grappling hook by combat engineers – throwing before resting

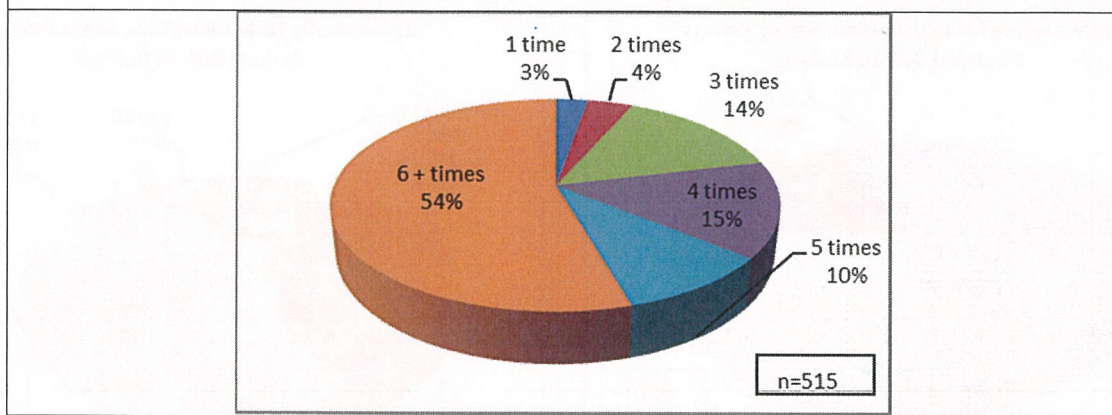


Table 9. Quantity of hook throws conducted before resting when grappling with a grappling hook

<u>Task Quantity</u>	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Smallest number (n=500)	6.3	3.0	3	40.4
Greatest number (n=499)	15.3	10.0	10	49.2

PSS-14 Mine Detector. Six questions were asked in this section. The first two questions using a fixed response format asked: 1) When you scanned for mines and/or improvised explosive devices (IEDs) with a PSS-14 Mine Detector or similar device, how far (in yards) did you usually scan? 2) When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, how long (in minutes) did this task usually take? Figure 11 displays the responses to these two questions. The other four questions were asked pertaining to the PSS-14 Mine Detector using an open response format: 3) When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, what is the shortest distance you scanned? 4) What was the longest distance you scanned? 5) What is the shortest time it took you to perform this task? 6) What is the longest time it took you to perform this task? Table 10 summarizes the responses to these four questions.

Figure 11. Usage of the PSS-14 mine detector by combat engineers

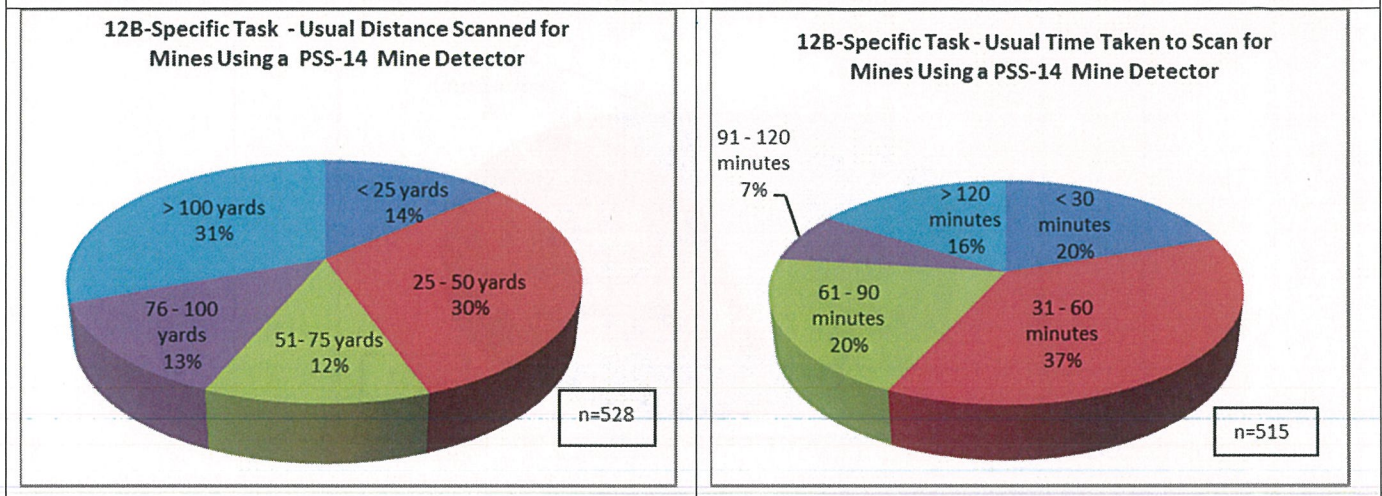


Table 10. Distances scanned and time taken to scan for mines/IEDs using a PSS-14 mine detector or similar devices

<u>Task</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Distances scanned (yds.)	Shortest distance (n=502)	51.2	15.0	10	258.5
	Longest distance (n=501)	890.3	100.0	100	5136.1
Time Taken (minutes)	Shortest time (n=490)	23.3	15.0	10	39.0
	Longest time (n=490)	126.1	60.0	60	316.7

Volcano Mine System. Three questions were asked in this section. The first question used a fixed response format to ask: How many Soldiers usually help you carry the equipment and install the Volcano Mine System? Figure 12 displays the responses to this question. The other two questions pertaining to the Volcano Mine System were asked using an open response format: 2) What was the smallest number of Soldiers helping you carry the Volcano Mine System? 3) What was the greatest number of Soldiers helping you carry the Volcano Mine System? Table 11 summarizes the responses to these two questions.

Figure 12. Usage of the Volcano Mine System by combat engineers

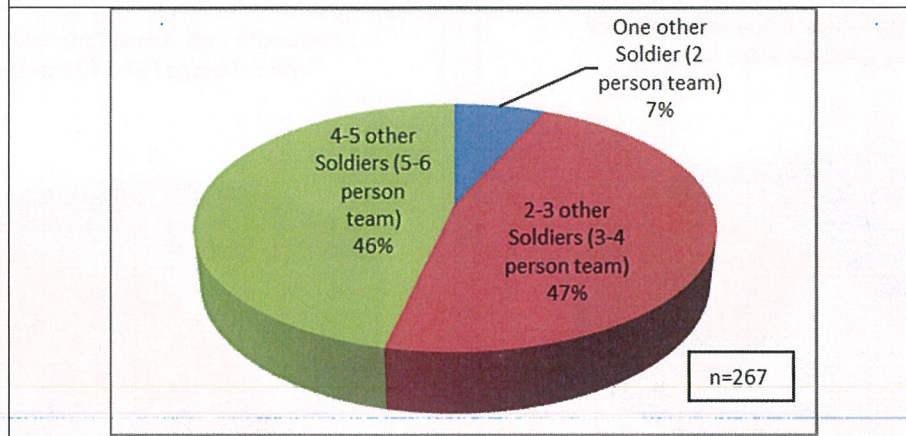


Table 11. Number of Soldiers assisting the respondent to carry the Volcano Mine System

<u>Quantity</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Number of Soldiers Assisting	Smallest number (n=447)	2.3	2.0	0	2.3
	Greatest number (n=445)	5.9	5.0	0	6.1

Section 4: Common Task Ratings

In the following pages, the results are summarized in terms of

- how often each common task was performed in the last two years,
- extent to which each task in the Common Task JAQ was expected to be performed,
- rated importance of each common task,
- rated time each common task takes to perform, and
- uniforms worn for each common task.

4.1. How Often Each Common Task Was Performed in the Last Two Years

Tasks with the same ranking numbers (i.e., with the same number on the far left in the chart title) do not significantly differ from each other. So for example, in Figure 13, all the tasks numbered “4” are performed at about the same rate of frequency.

Figure 13. Frequencies with which common tasks were performed in the last two years

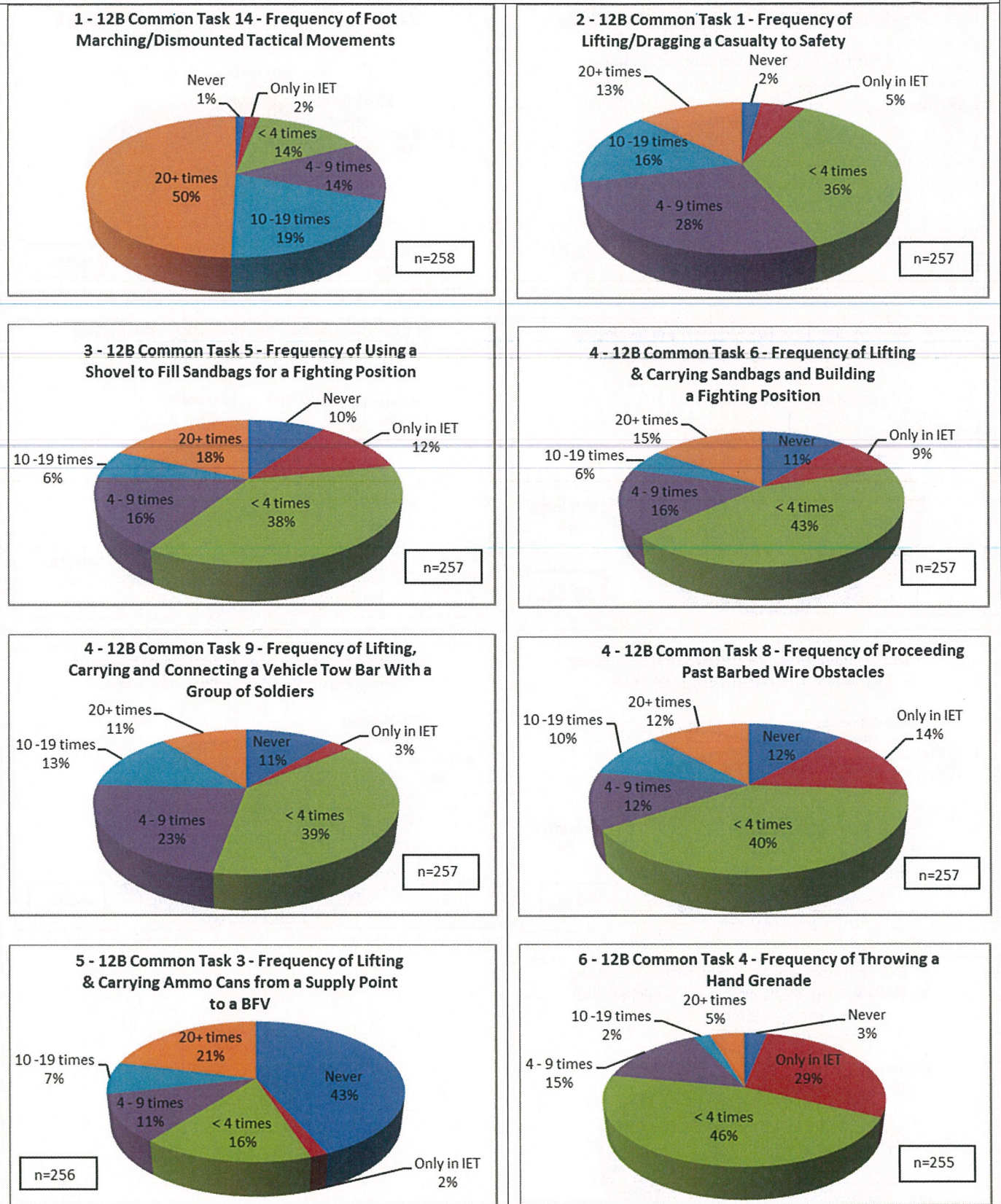
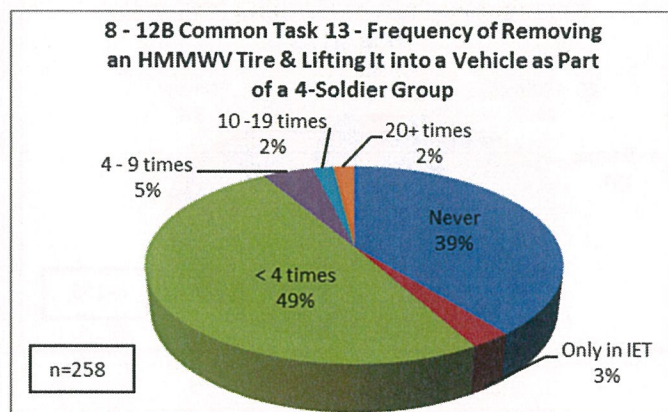
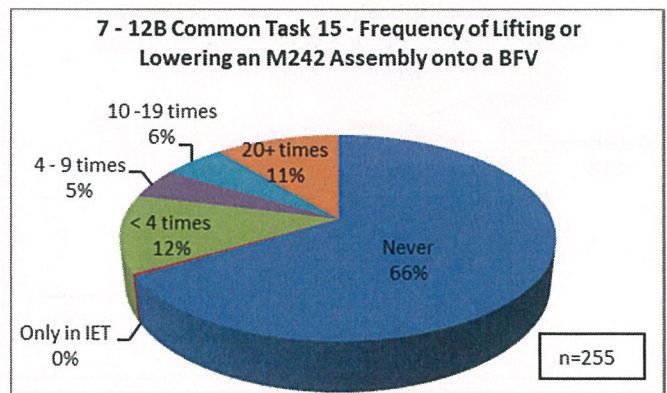
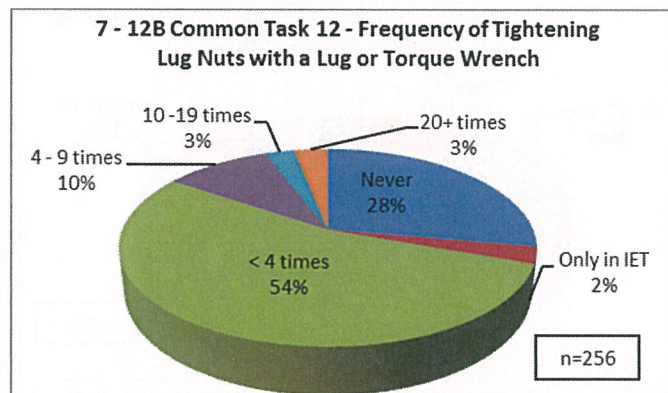
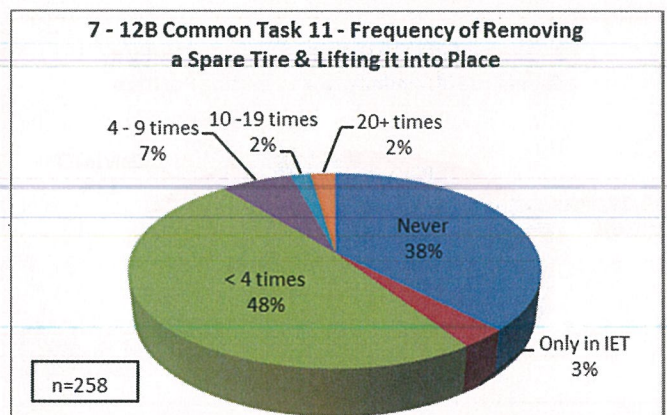
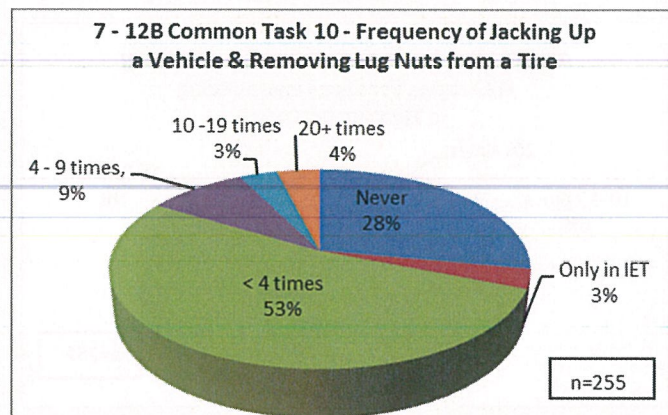
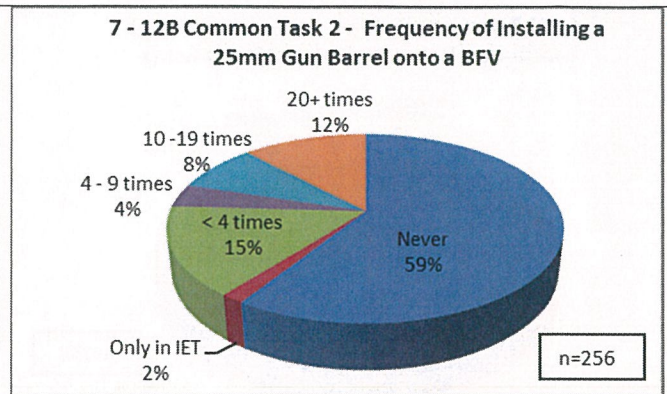
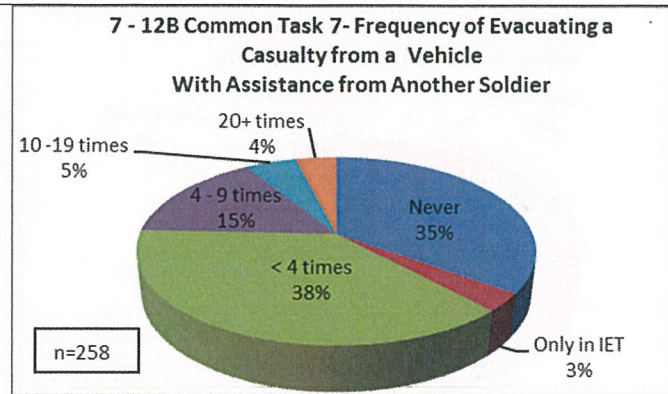


Figure 13. Continued



For each of the tasks represented by the JAQ, respondents were asked whether they were expected to complete the task if the situation arises. Table 12 displays the responses to this question for each of the tasks included on the Common Task JAQ.

Table 12. The extent to which each task on the Common Task JAQ was expected to be performed

<u>Common Task</u> ¹	<u>Yes, I am Expected to Perform This Task</u>	<u>No, I am Not Expected to Perform This Task</u>
1) Lift and Drag a Casualty to Safe Location (n=256)	98%	2%
1) Perform a dismounted foot march or tactical movement (n=258)	98%	2%
2) With a group of Soldiers, lift, carry and connect a vehicle tow bar for a Buffalo, BFV or Stryker from a towing vehicle to the disabled vehicle (n=258)	93%	7%
2) Throw a Hand Grenade (n=257)	93%	7%
2) Lift and carry sandbags to an emplacement location and build a fighting position (n=255)	91%	9%
2) Use a shovel or entrenching tool to fill sand bags when preparing to build a fighting position (n=258)	91%	9%
3) Climb over, through, or around barbed wire obstacles (n=258)	87%	13%
3) With the assistance of another Soldier, pull a casualty from a commander's seat and through the top hatch of a vehicle (i.e., BFV or Stryker) (n=256)	86%	14%
4) Jack up a vehicle and remove lug nuts from a flat tire (n=256)	79%	21%
4) With the assistance of another Soldier, remove a spare tire from a HMMWV, roll into place, and lift onto the axle of the disabled vehicle (n=258)	76%	24%
4) Manually tighten the lug nuts on a tire with a lug or torque wrench (n=255)	74%	26%
4) As part of a group of four Soldiers, remove the flat tire from a HMMWV, then roll and lift it into the back of a vehicle (n=254)	74%	26%
5) Lift and carry ammunition cans from the supply point (e.g., ammunition center or truck) to the back of a BFV (n=258)	68%	32%
6) - With assistance from another Soldier, lift, carry, and install the barrel of a 25mm gun onto a BFV (n=256)	58%	42%

¹ The numbers of subjects who answered each particular item are listed at the end of each item.

4.2. Rated Importance of Each Common Task

Tasks with the same ranking numbers (i.e., with the same number on the far left in the chart title) do not statistically differ from each other. So for example, in Figure 14, both the tasks numbered “2” are rated as taking about the same amount of time to complete.

Figure 14. The rated importance of each common task

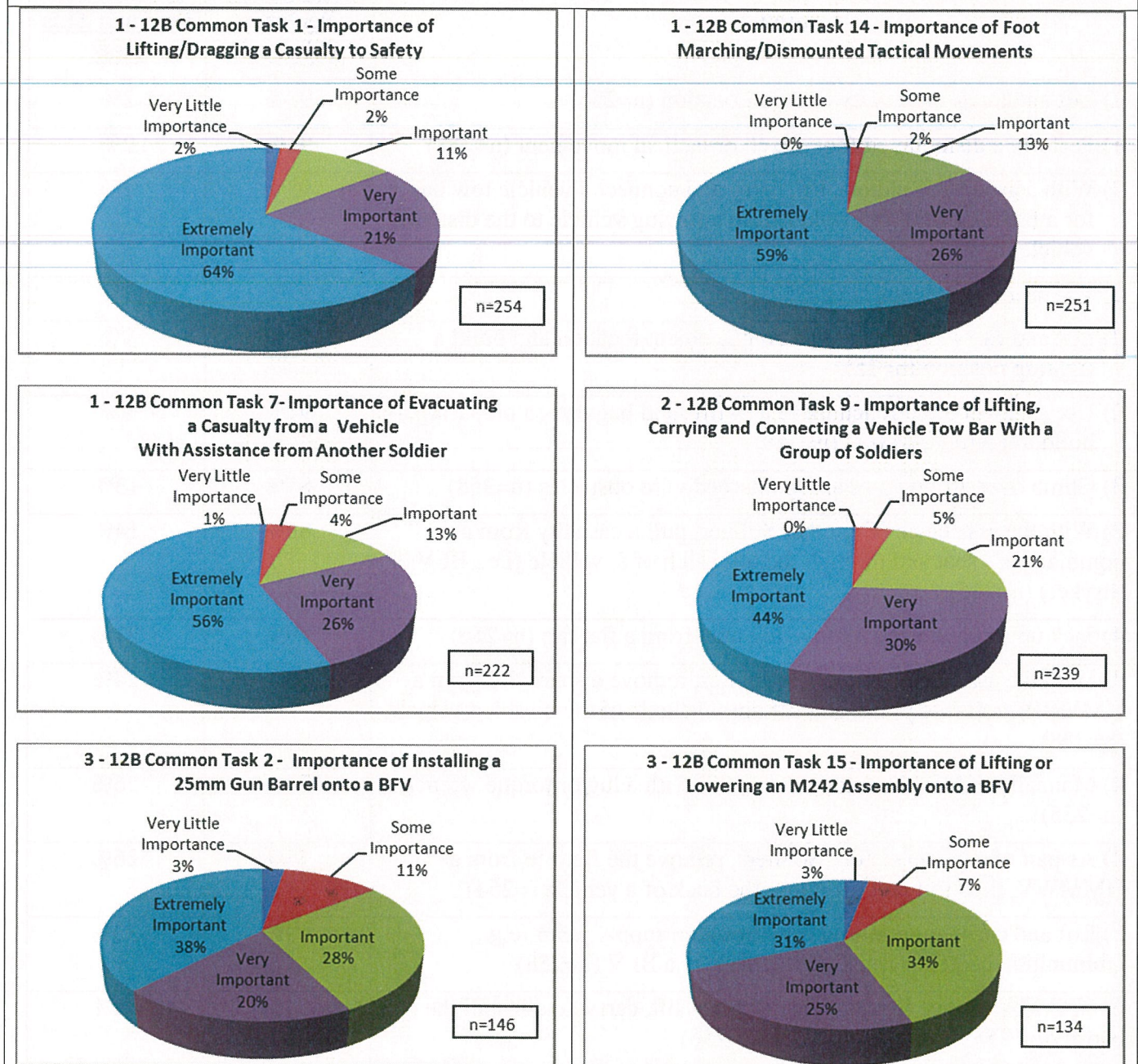
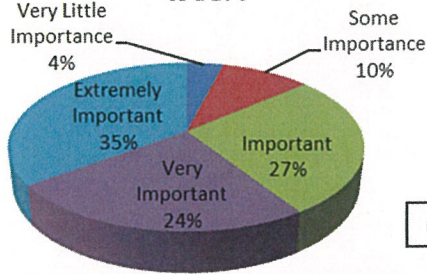
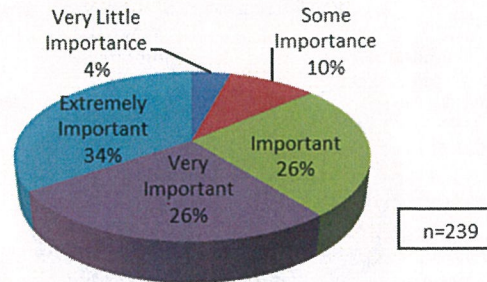


Figure 14. Continued

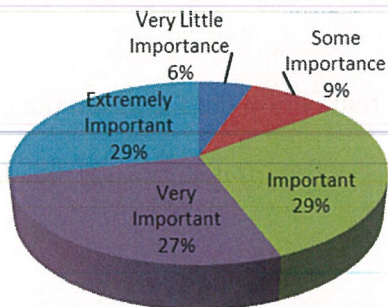
3 - 12B Common Task 3 - Importance of Lifting & Carrying Ammo Cans from a Supply Point to a BFV



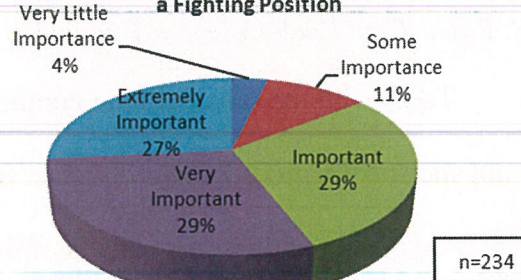
3 - 12B Common Task 4 - Importance of Throwing a Hand Grenade



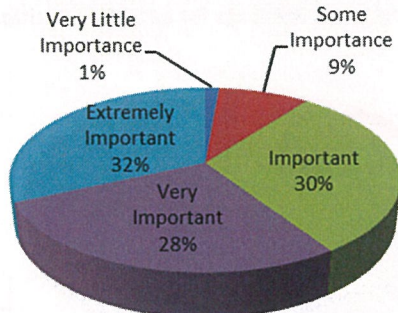
3 - 12B Common Task 5 - Importance of Using a Shovel to Fill Sandbags for a Fighting Position



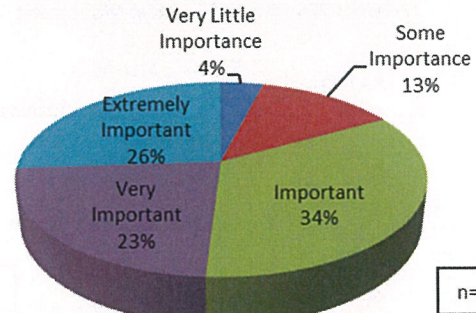
3 - 12B Common Task 6 - Importance of Lifting & Carrying Sandbags and Building a Fighting Position



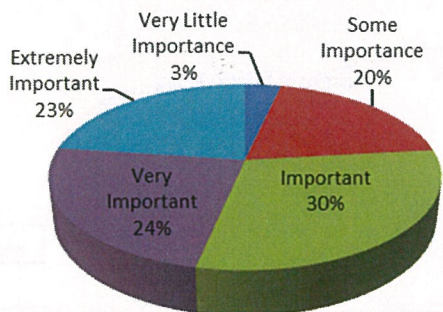
3 - 12B Common Task 8 - Importance of Proceeding Past Barbed Wire Obstacles



4 - 12B Common Task 10 - Importance of Jacking Up a Vehicle & Removing Lug Nuts from a Tire



5 - 12B Common Task 11 - Importance of Removing a Spare Tire & Lifting it into Place



6 - 12B Common Task 12 - Importance of Tightening Lug Nuts with Lug or Torque Wrench

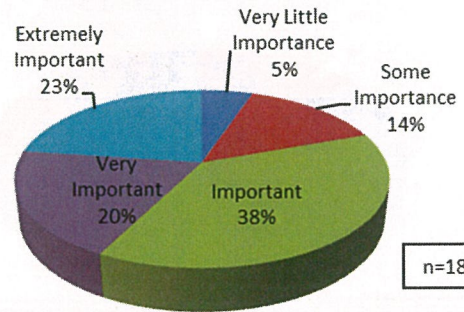
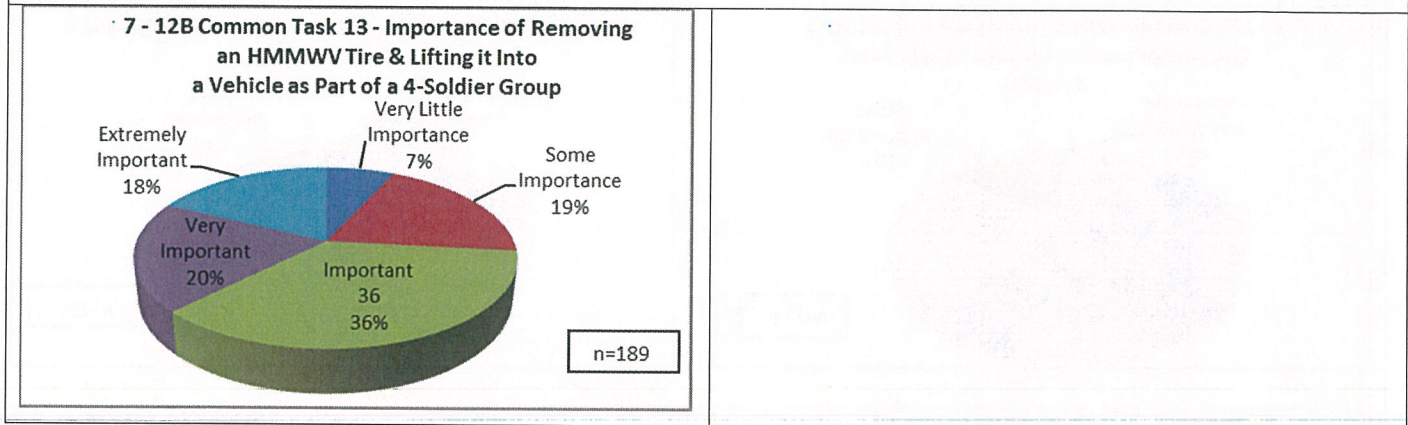


Figure 14. Continued



4.3. Rated Time Each Common Task Takes to Perform

Tasks with the same ranking numbers (i.e., with the same number on the far left in the chart title) do not statistically differ from each other. So for example, in Figure 15, both the tasks numbered “2” are rated as taking about the same amount of time to complete.

Figure 15. The time required to perform each common task one time

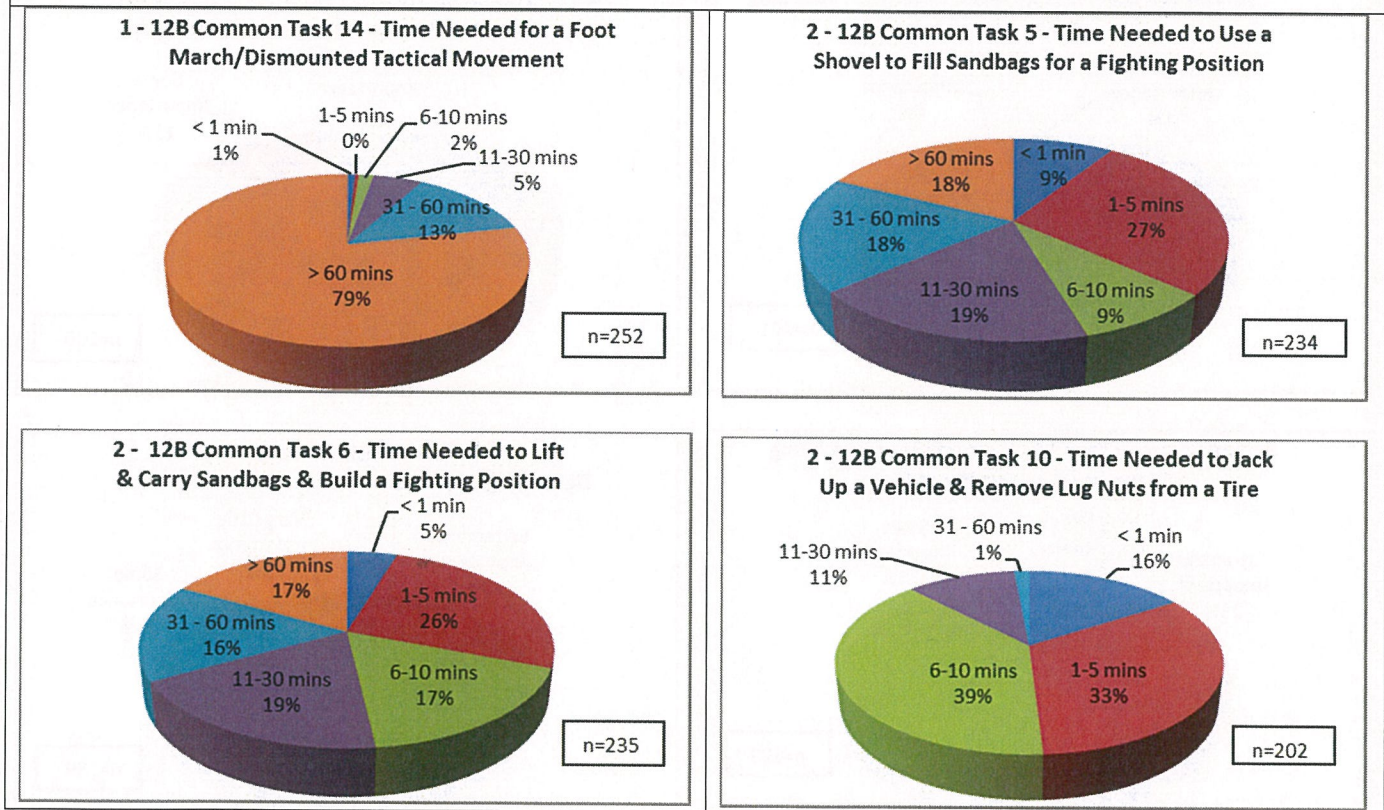
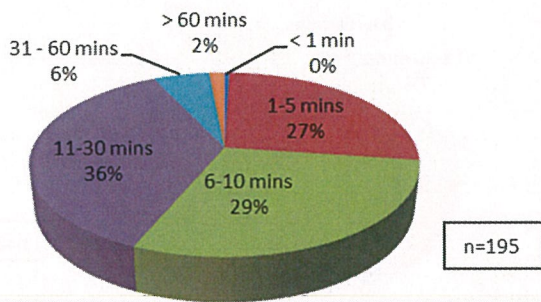
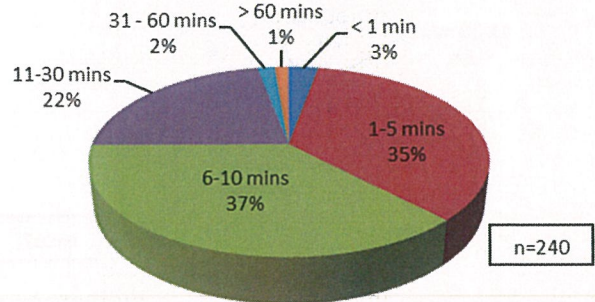


Figure 15. Continued

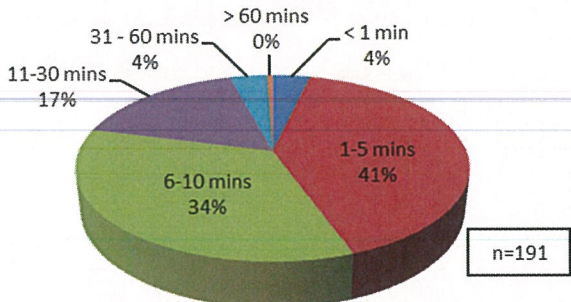
3 - 12B Common Task 11 - Time Needed to Remove a Spare Tire From a HMMWV & Lift It into Place



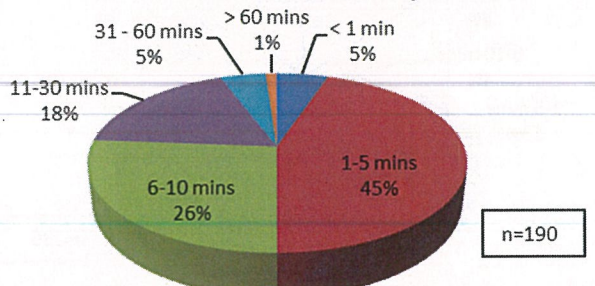
4 - 12B Common Task 9 - Time Needed to Lift, Carry and Connect a Vehicle Tow Bar



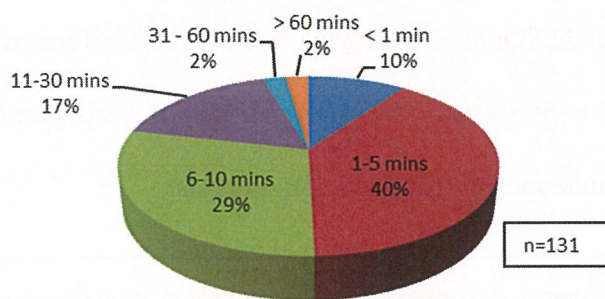
4 - 12B Common Task 12 - Time Needed to Tighten Lug Nuts with a Lug or Torque Wrench



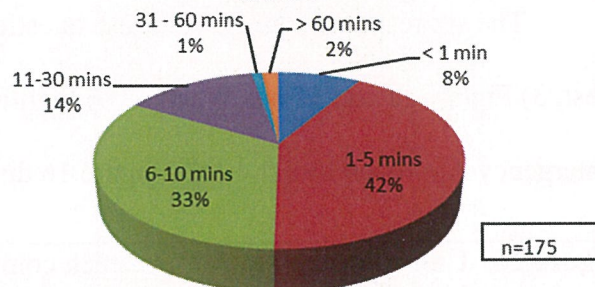
4 - 12B Common Task 13 - Time Needed to Remove a HMMWV Tire & Lift it into a Vehicle as Part of a 4-Soldier Group



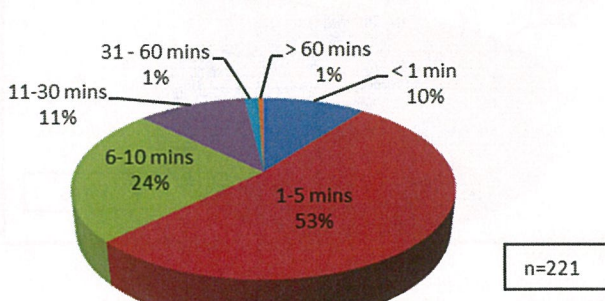
4 - 12B Common Task 15 - Time Needed to Lift or Lower an M242 Assembly onto a BFV



5 - 12B Common Task 3 - Time Needed to Lift & Carry Ammo Cans from a Supply Point to a BFV



6 - 12B Common Task 8 - Time Needed to Proceed Past Barbed Wire Obstacles



6 - 12B Common Task 2 - Time Needed to Install a 25mm Gun Barrel onto a BFV

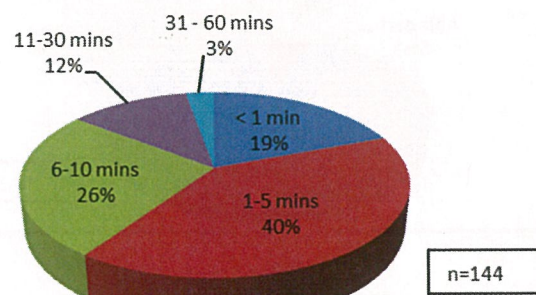
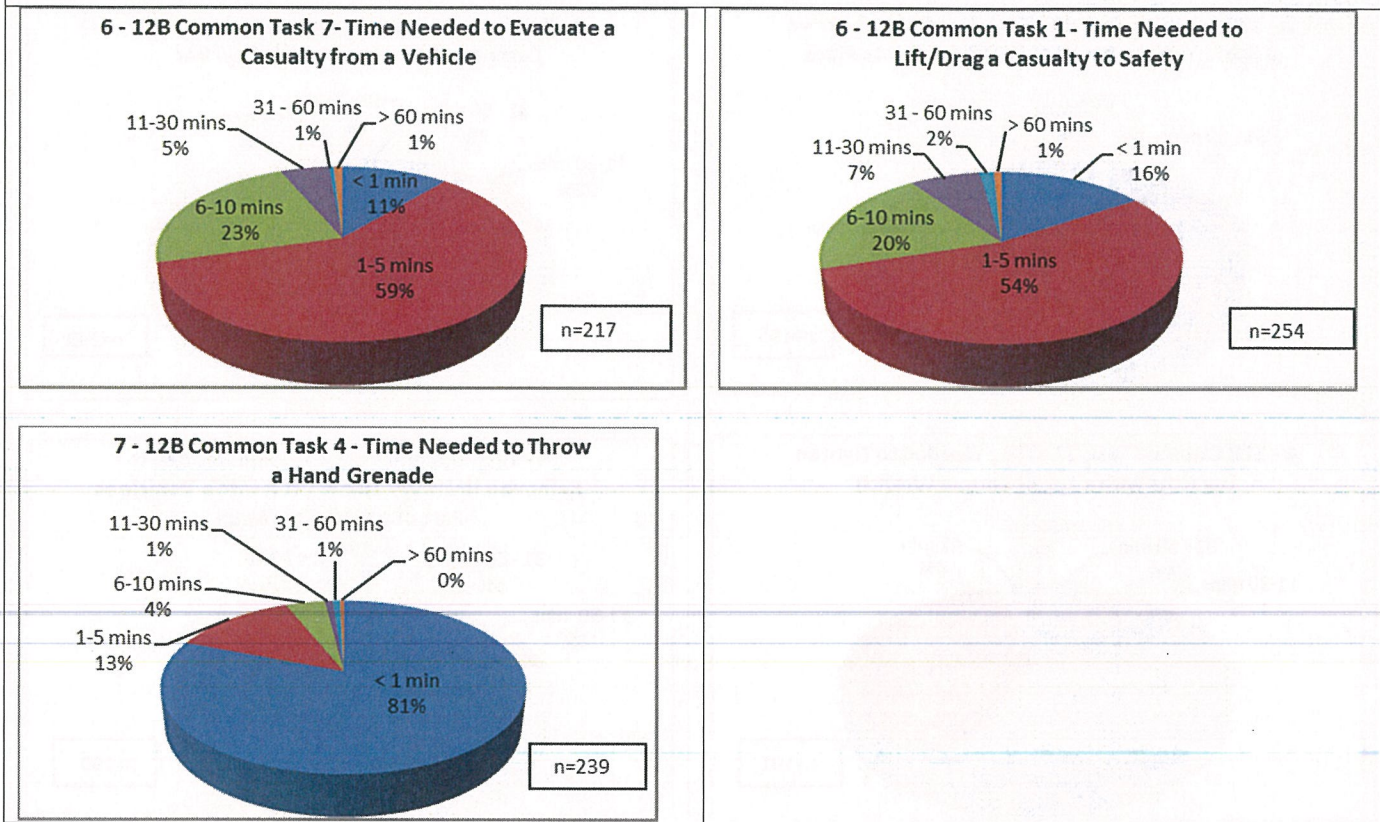


Figure 15. Continued



4.4. Rated Time Each 12B-Specific Task Takes to Perform

The six response options for these questions were: 1) Standard Uniform, 2) Standard Uniform with Vest, 3) Fighting Load Minus Weapon, 4) Fighting Load with Weapon, 5) Approach March Load, and 6) Emergency Approach March Load. Figure 16 displays the responses for each common task.

Figure 16. Uniforms worn to perform each common task

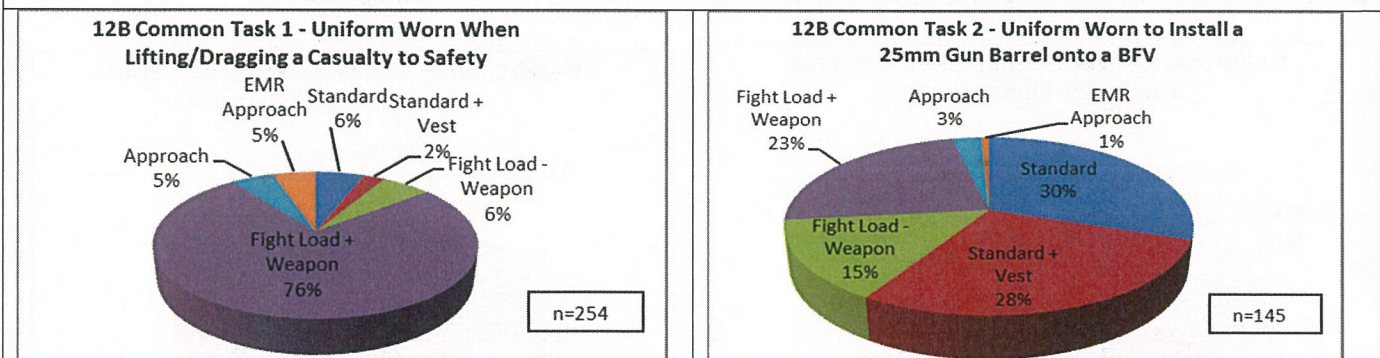
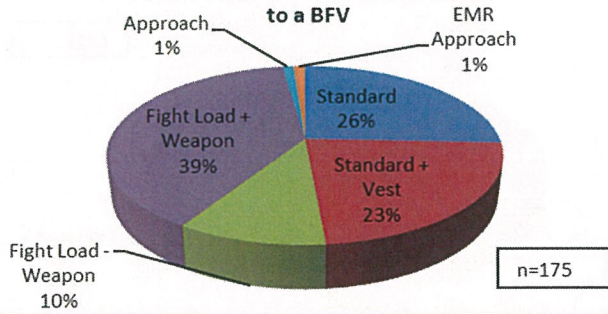
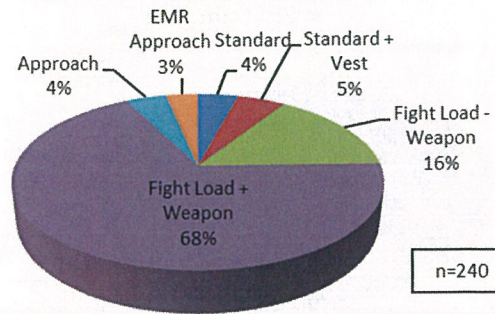


Figure 16. Continued

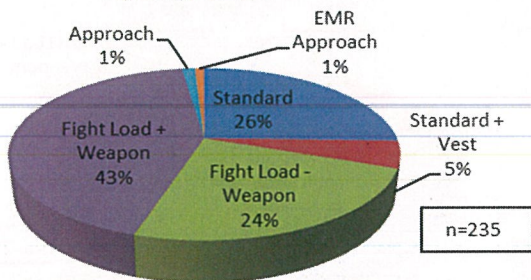
12B Common Task 3 - Uniform Worn to Lift & Carry Ammo Cans from a Supply Point to a BFV



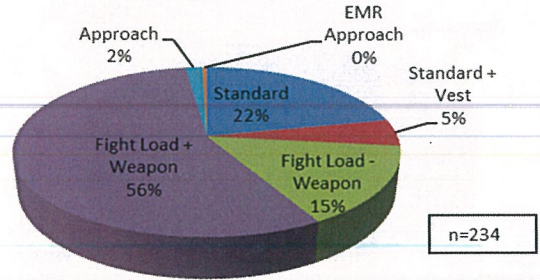
12B Common Task 4 - Uniform Worn When Throwing a Hand Grenade



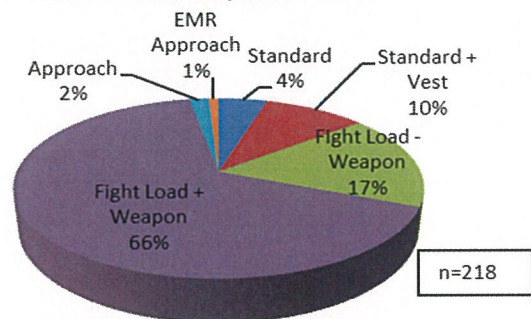
12B Common Task 5 - Uniform Worn to Use a Shovel to Fill Sandbags for a Fighting Position



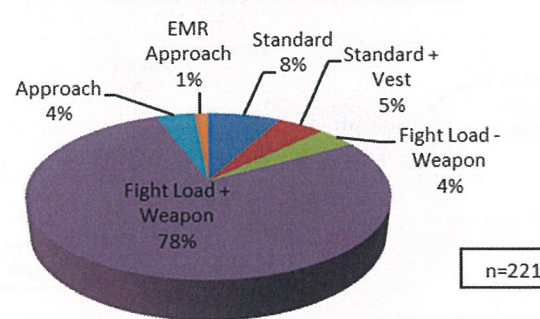
12B Common Task 6 - Uniform Worn to Lift & Carry Sandbags & Build a Fighting Position



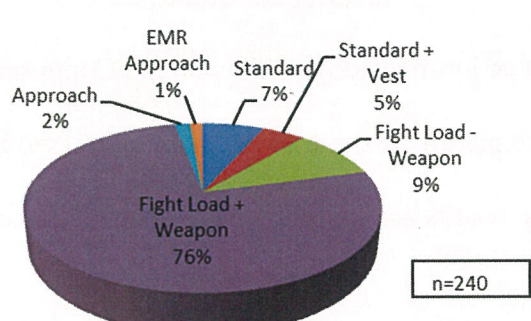
12B Common Task 7 - Uniform Worn to Evacuate a Casualty from a Vehicle



12B Common Task 8 - Uniform Worn to Proceed Past Barbed Wire Obstacles



12B Common Task 9 - Uniform Worn to Lift, Carry & Connect a Vehicle Tow Bar



12B Common Task 10 - Uniform Worn to Jack Up a Vehicle & Remove Lug Nuts from a Tire

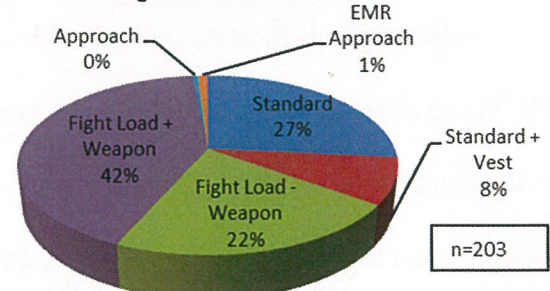
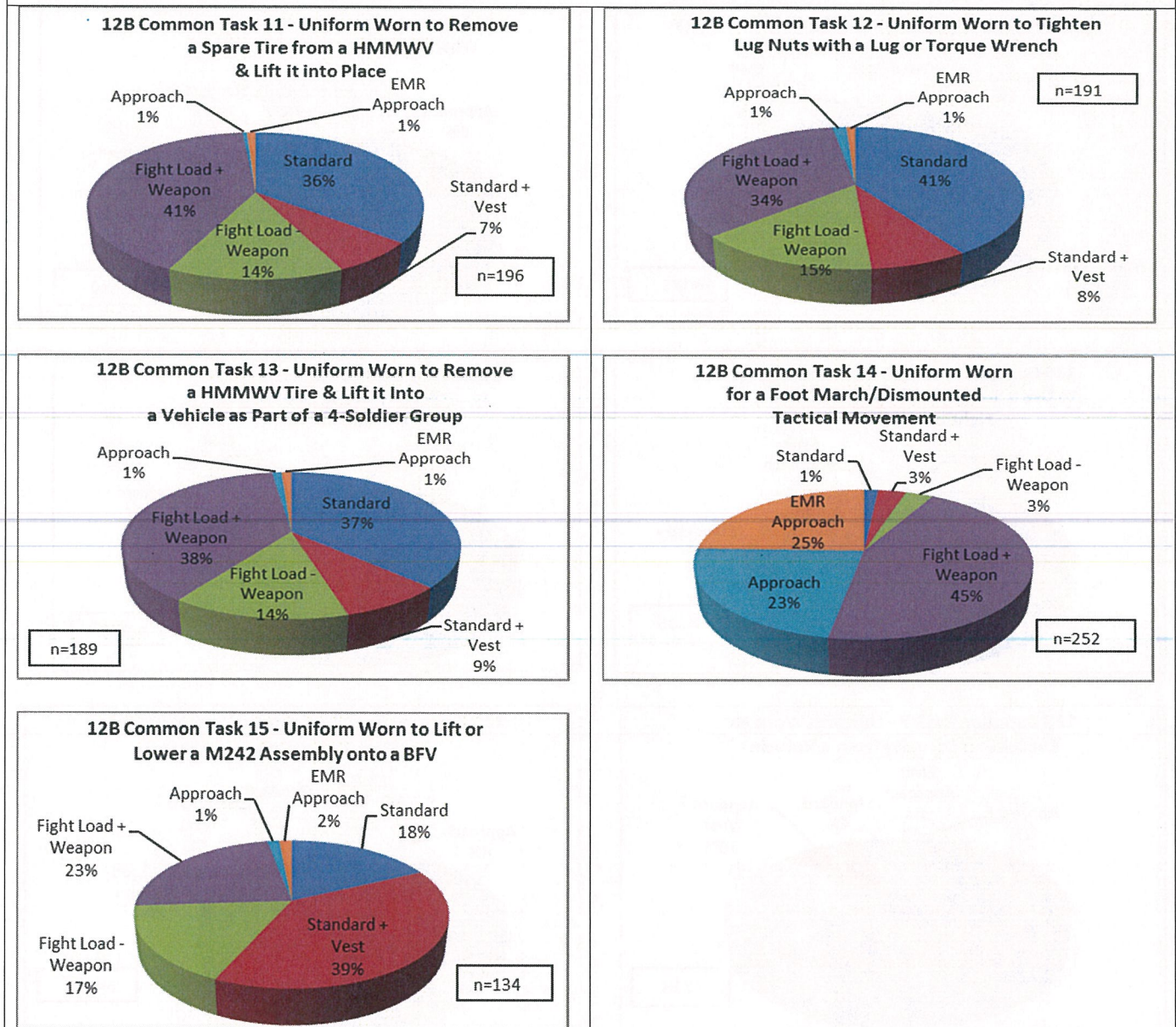


Figure 16. Continued



Section 5: Common Task Supplemental Information

Following is information obtained by a second set of job-related questions on the Common Task JAQ. These questions were asked to gain a more complete picture of some of the tasks addressed in the previous portion of the survey. In the following pages, the results are summarized in terms of the order in which the item topics appear in the questionnaire.

5.1. Time, Quantity and Distance Pertaining to Common Tasks

25mm Ammo Cans: Six questions were asked in this section pertaining to ammo cans. The first two questions using a fixed response format asked: 1) When fully supplying a BFV, what is the total number of 25mm ammo cans you usually carry from a supply point to the vehicle? 2) How far (in yards) did you usually carry 25mm ammo cans from the supply point to the BFV? Figure 17 displays the responses to these two questions. An additional four questions were asked pertaining to the carrying of 25mm ammo cans using an open response format: 3) What is the smallest number of 25mm ammo cans you ever personally carried from a supply point to a BFV? 4) What is the largest number of 25mm ammo cans you ever personally carried from a supply point to a BFV? 5) What is the shortest distance (yards) you ever carried 25mm ammo cans from a supply point to a BFV? 6) What is the longest distance (yards) you ever carried 25mm ammo cans from a supply point to a BFV? Table 13 summarizes the responses to these four questions.

Figure 17. Usage of 25mm ammo cans by combat engineers – carried to a BFV

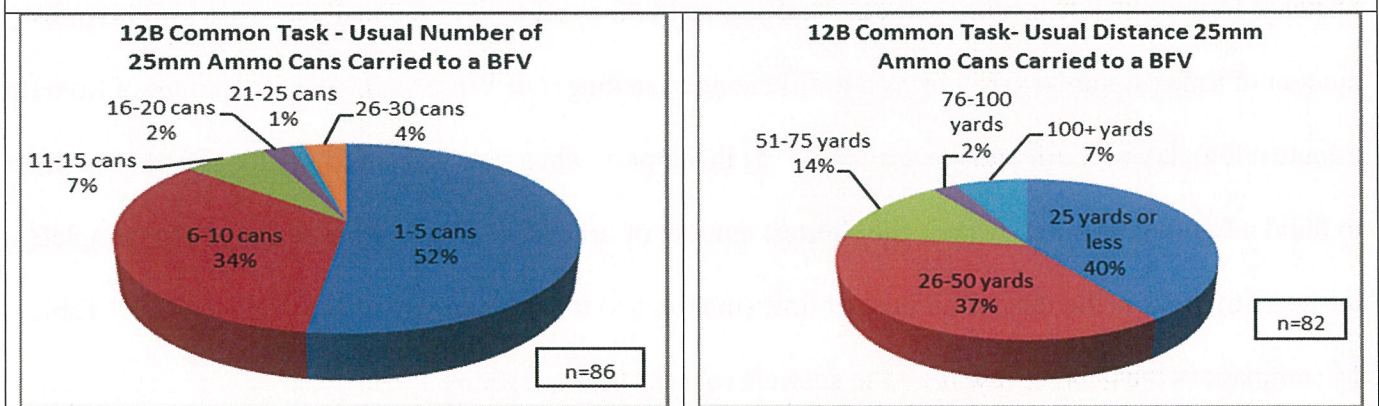


Table 13. Number of 25mm ammo cans subjects carried and distance they carried them from a supply point to a BFV

<u>Task</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Quantity of ammo cans	Smallest number (n=80)	1.8	1.0	1	1.9
	Largest number (n=80)	6.0	4.0	2	6.7
Distance carried (yds.)	Shortest distance (n=77)	12.4	10.0	5	11.3
	Farthest distance (n=77)	67.3	50.0	50	68.2

Fill Sandbags/Build Fighting Position: Six questions were asked in this section. The first two questions using a fixed response format asked: 1) How long does it usually take you to fill enough sandbags to build one fighting position? 2) How long does it usually take you to carry sandbags to a designated location and build a fighting position? Figure 18 displays the responses to these two questions. An additional four questions were asked pertaining to the carrying of 25mm ammo cans using an open response format: 3) When filling enough sandbags to build a single fighting position, what is the shortest amount of time (in minutes) it took you to fill enough sandbags? 4) What is the longest amount of time (in minutes) it took you to fill enough sandbags? 5) In the past, when you've carried sandbags and used them to build a fighting position, what is the shortest amount of time (in minutes) it has taken you to complete the task? 6) What is the longest amount of time (in minutes) it has taken you to complete the task? Table 14 summarizes the data representing the answers to these four questions.

Figure 18. Time required to fill and carry sandbags by combat engineers to build a fighting position

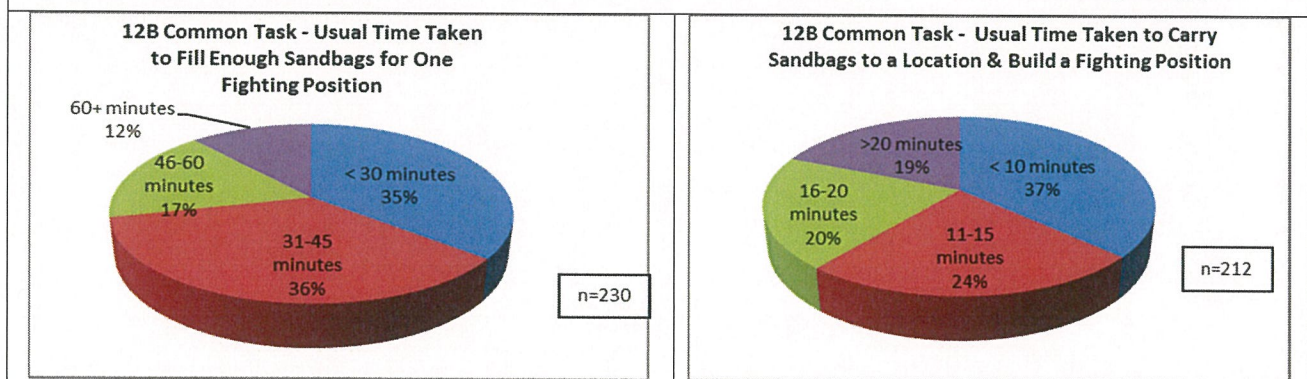


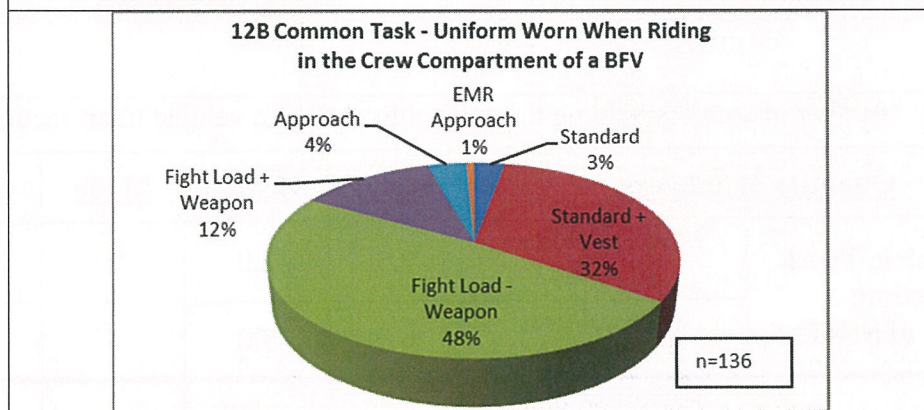
Table 14. Time (minutes) spent by respondents to fill and carry enough sandbags for a fighting position and then build the fighting position

<u>Task</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Time to Fill	Shortest time (n=216)	33.8	30.0	30	68.3
	Longest time (n=216)	77.1	50.0	60	212.7
Time to Carry and Build	Shortest time (n=197)	44.0	15.0	10	341.9
	Longest time (n=197)	165.9	30.0	60	1707.7

Uniform Worn When Riding in a BFV: One fixed response question was asked in this section:

Which response best describes the uniform you wear when riding in the crew compartment of a BFV or Stryker? The response options for this question were: 1) Standard Uniform, 2) Standard Uniform with Vest, 3) Fighting Load Minus Weapon, 4) Fighting Load with Weapon, 5) Approach March Load, and 6) Emergency Approach March Load. Figure 19 displays the responses to this question.

Figure 19. Uniform worn by combat engineers when riding in a BFV



Change Vehicle Track Section/Tire: Six questions were asked in this section of the JAQ. The

first two questions using a fixed response format asked: 1) When you changed a section of track on a vehicle (for example, BFV, M9 armored combat earthmover or ACE, Assault Breacher Vehicle), how many other Soldiers usually helped you perform the task? 2) When you changed a tire on a vehicle (for example, a Stryker or mine-resistant ambush protected (MRAP)), how many other Soldiers usually helped

you perform the task? Figure 20 displays the responses to these two questions. An additional four questions were asked in this section using an open response format: 3) When you changed a section of track on a vehicle (for example, BFV, M9 ACE, Assault Breacher Vehicle), what is the smallest number of Soldiers who helped you perform the task? 4) What is the greatest number of Soldiers who helped you perform the task? 5) When you changed a tire on a vehicle like the Stryker or MRAP, what is the smallest number of Soldiers who helped you perform the task? 6) What is the greatest number of Soldiers who helped you perform the task? Table 15 displays data representing the answers to these four questions.

Figure 20. Assistance provided in changing tires or tracks on a vehicle

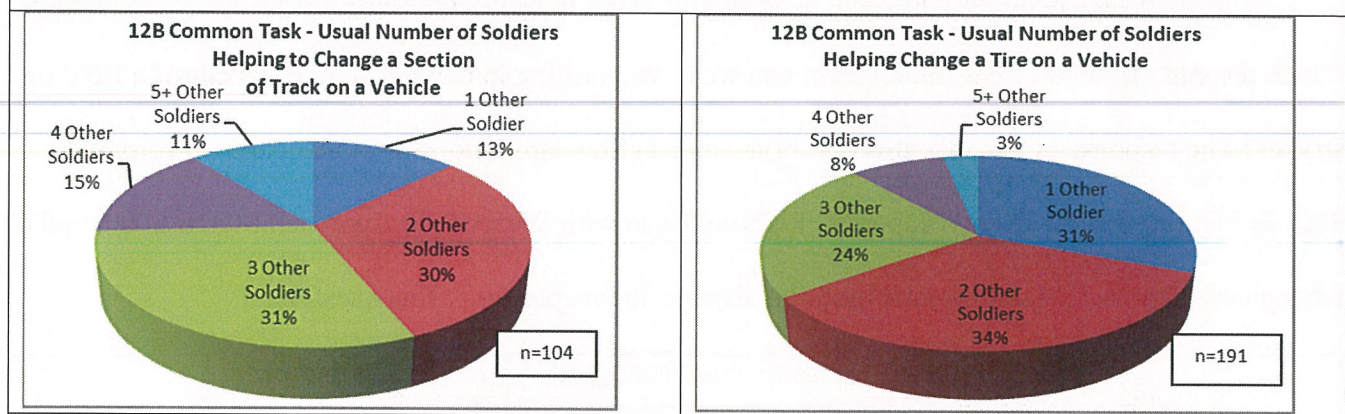


Table 15. Number of soldiers helping the subject to change a vehicle track section or tire

<u>Quantity of Soldiers</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
For Vehicle Track Section: Number of Soldiers	Fewest soldiers (n=149)	2.3	2.0	2	4.9
	Most soldiers (n=149)	6.0	5.0	4	8.2
For Vehicle Tire: Number of Soldiers	Fewest soldiers (n=184)	2.1	2.0	1	3.2
	Most soldiers (n=183)	4.6	4.0	3	5.8

Lug Nuts: Two questions were asked in this section using an open response format: 1) When you changed a tire on a vehicle (for example, a Stryker or MRAP), what percentage of those times did you loosen and/or tighten the lug nuts manually with a wrench? 2) What percentage of those times did you use

an air-operated impact wrench? Table 16 summarizes data representing the answers to these two questions.

Table 16. Percentage of times the subject loosened lug nuts manually with a wrench or by using an air-operated impact wrench				
<u>Task</u>	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Manually (n=196)	61.4	75.0	100	34.2
With Impact Wrench (n=196)	30.4	25.0	0	30.2

Dismounted Tactical Movement: Six questions were asked in this section. The first two questions using a fixed response format asked: 1) When performing a dismounted tactical movement, how far do you usually move? 2) When you performed a dismounted tactical movement, how heavy was the load you usually carried? Figure 21 displays the responses to these two questions. The other four questions in this section were asked using an open response format: 3) When you performed a dismounted tactical movement, what is the shortest distance you moved (in miles)? 4) What is the longest distance you moved (in miles)? 5) When you performed a dismounted tactical movement, what is the lightest load you carried (in pounds)? 6) What is the heaviest load you carried (in pounds)? Table 17 summarizes data representing the answers to these four questions.

Figure 21. Dismounted tactical movement activity performed by combat engineers

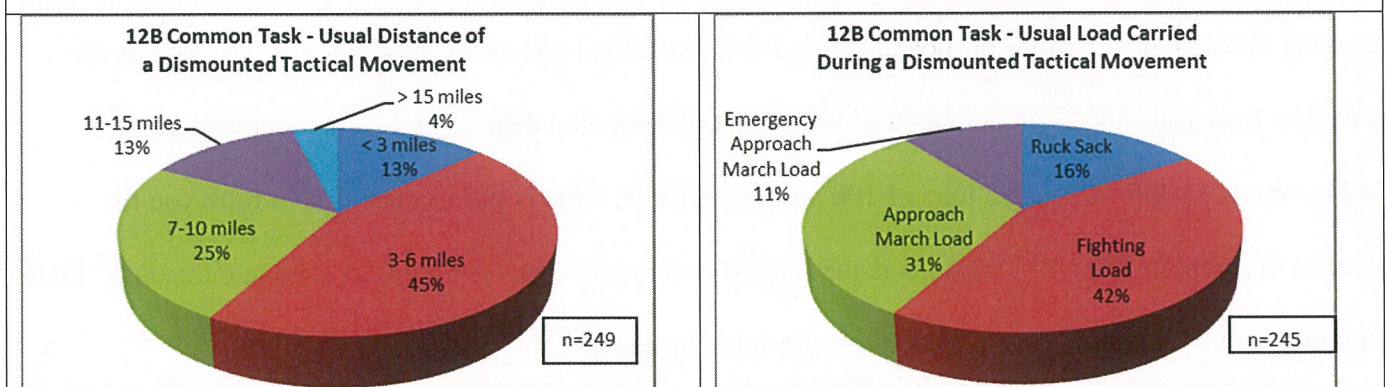


Table 17. Distances covered and loads carried by subjects during a dismounted tactical movement					
<u>Task</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
<u>Distance (Miles)</u>	Shortest distance (n=242)	2.2	1.0	1	1.9
	Longest distance (n=242)	14.0	12.0	15	9.6
<u>Loads (Pounds)</u>	Lightest load (n=239)	38.8	35.0	35	23.2
	Heaviest load (n=239)	89.5	85.0	100	32.0

Six-Plus Mile Dismounted Tactical Movement: Six questions were asked in this section. The first two questions using a fixed response format asked: 1) How much weight do you usually carry when performing a dismounted tactical movement of 6 miles or more? (Response options to this question were: Ruck Sack (40 pounds), Fighting Load (about 80 pounds), Approach March Load: Fighting load with weapon plus 20-25 pound assault pack, and Emergency Approach March Load (about 125 pounds or more); Fighting load with sustainment load weighing 40-50 pounds); and question 2) How long does it usually take you to perform a dismounted tactical movement of at least 6 miles while carrying a load of 100 pounds or more? Figure 22 displays the responses to these two questions. An additional four questions were asked in this section using an open response format: 3) When you performed a dismounted tactical movement of 6 miles or more, what is the lightest load you carried (in pounds)? 4) What is the heaviest load you carried (in pounds)? 5) When you performed a dismounted tactical movement of 6 miles or more while carrying a load of 100 pounds or more, what is the shortest time it took you (in hours) to complete this task? 6) What is the longest time it took you (in hours) to complete this task? Data representing the answers to these questions are summarized in Table 18.

Figure 22. Six-plus mile dismounted tactical movement activity performed by combat engineers

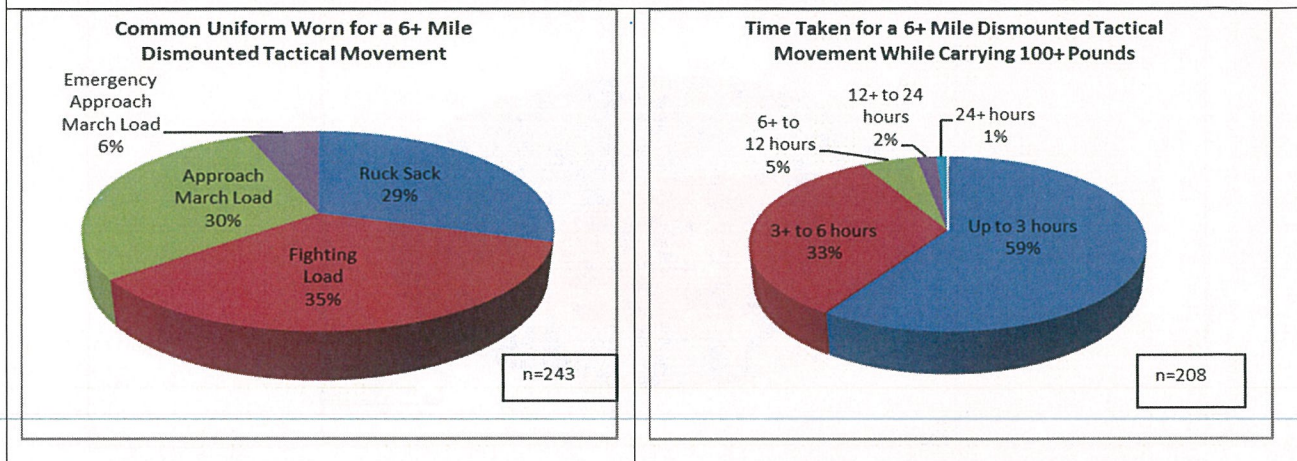


Table 18. Loads carried and time taken by subjects during dismounted tactical movements of six miles or more

<u>Task</u>		<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Load Carried (Pounds)	Lightest Load (n=233)	37.3	35.0	35	22.6
	Heaviest Load (n=233)	81.6	80.0	80	31.5
Time Taken (Hours)	Shortest Time (n=198)	3.1	2.0	2	6.4
	Longest Time (n=198)	5.9	4.0	3	11.2

Carrying Sandbags: Three questions were asked in this section. The first question, using a fixed response format, asked: When you carried sandbags to build a protective bunker, how long did it usually take you to carry the required number of sandbags to the designated location for the bunker? Figure 23 displays the responses to this question. An additional two questions were asked in this section using an open response format: 2) When you carried sandbags to build a protective bunker, what is the shortest time (in minutes) it took to carry the sandbags and build the bunker? 3) What is the longest time (in minutes) it took to carry the sandbags and build the bunker? Table 19 summarizes data representing the answers to these two questions.

Figure 23. Time required by combat engineers to carry sandbags to build a bunker

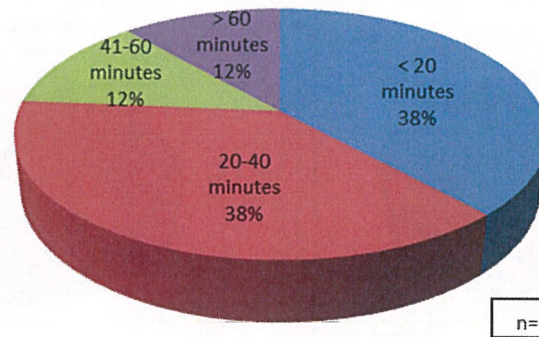


Table 19. Time taken by respondents to carry sandbags and build a bunker

<u>Task Time (Minutes)</u>	<u>Mean</u>	<u>Median</u>	<u>Mode</u>	<u>Std Dev</u>
Shortest time (n=179)	27.5	20.0	20	35.1
Longest time (n=177)	85.6	40.0	60	361.0

Section 6: Contrasting Time Spent Performing Tasks in Garrison and in Deployment Settings

The following results are presented by questionnaire and were derived by analyzing all items that could be used to distinguish tasks performed in garrison settings from those conducted in deployment settings.

6.1. 12B-Specific Task JAQ.

Only two items on the 12B-specific task JAQ provide a means to compare time spent conducting job-related tasks in garrison settings to time spent conducting similar tasks during combat deployments. These two items were as follows: Item 73: “During a typical week in garrison (or training weekend for AR/NG), what percentage of your time do you spend performing combat engineer tasks (i.e., obstacle breaching, emplacing/clearing obstacles, building bridges, etc.)?” Item 74: “During your last combat deployment, what percentage of your time did you spend performing combat engineer tasks (i.e., obstacle

breeching, emplacing/ clearing obstacles, building bridges, etc.)?” Item responses ranged from less than 25% of the time to over 75% of the time.

Responses to these two items indicated that combat engineer tasks were generally performed more often during combat deployments than in garrison settings. Forty-eight percent of the sample indicated that they spent more of their time performing combat engineer tasks during combat deployments than they did in garrison, whereas only 16% responded they spent more time performing combat engineer tasks while in garrison than during their last combat deployment.

6.2. Common Task JAQ.

The Common Task JAQ also had only two items that provided a means to compare time spent conducting job-related tasks in garrison settings to time spent conducting similar tasks during combat deployments. However, these two items each contained seven sub-items addressing specific types of tasks (i.e., seated tasks, less active tasks, loading and unloading supplies and equipment, tactical marches/patrolling, MOS-specific tasks, physically demanding combat arms tasks, and physical training). Soldiers were asked to provide estimates of the percentages of time they spent performing each of these types of tasks in both garrison/training and combat settings. Results addressing tasks performed in garrison or training settings were compared to those pertaining to tasks conducted during combat deployments.

Table 20 displays the results of the comparative analysis. Consistent with expectations and the results noted from the 12B-specific JAQ data, Soldiers in the 12B MOS reported spending a greater percentage of their time performing MOS-specific tasks during combat deployments (39% more), as compared to garrison and training settings. They also said they spent nearly twice as much time (92% more) performing tactical foot marches and walking patrols during combat deployments. This sample reported spending more time performing seated and less active tasks in garrison, but they also said they spent more time in garrison performing physical readiness training.

Table 20. Mean estimates of time spent performing different types of tasks in both garrison or training settings and combat deployments

<u>Type of Task</u>	<u>In Garrison or Training</u>	<u>During Combat Deployment</u>	<u>Percentage Trend from Person to Person</u>
Seated tasks (clerical duties, classroom- or computer-based training)	22.1%	8.6%	156% more time in garrison/training settings
Physical Training	16.9%	11%	55% more time in garrison/training settings
Less Active Tasks (vehicle maintenance, driving, cleaning, charge of quarters or guard)	15.5%	13.2%	18% more time in garrison/training settings
Loading/Unloading Supplies and Equipment	7.4%	8.8%	18% more time during combat deployments
MOS-Specific Tasks (i.e. tasks that only Soldiers in your MOS perform)	15.4%	21.3%	39% more time during combat deployments
Physically Demanding Combat Arms Tasks (i.e. tasks common to many combat arms MOS's)	12.3%	17.3%	40% more time during combat deployments
Tactical marches/patrolling	10.4%	19.8%	92% more time during combat deployments

Section 7: Comparing Subjects Who Had Been Deployed to Those Who Had Not Deployed

Another set of analyses that can be used to further understanding concerning differences in performance from one work setting to another is to compare the work performance of Soldiers who had been deployed to those who had not been deployed. Much more information from the two JAQ's can be included using this strategy, but this set of analyses is also limited in that nearly all the Soldiers in both survey samples had been deployed (96% of the sample completing the 12B-specific task JAQ and 95% of the sample completing the Common Task JAQ had deployed). The results from these analyses are provided, however, because they may be useful to decision and policy makers.

In the following pages, the results are summarized by questionnaire, and within each questionnaire the groups of items are presented in tables in the following order: others' expectancies pertaining to task performance, how often tasks were performed in the last two years, the rated importance of each task, the rated time each task takes to perform, and supplementary information concerning the tasks.

7.1. 12B-Specific Task JAQ

The comparisons of participants who had deployed at least once to those who had not on aspects of the 12B-specific tasks (e.g., the likelihood of being expected to perform the tasks if the situation arose, the numbers of times the tasks were performed, their importance to job success, and the time to needed to perform them one time) are reported in Tables 21, 22 and 23. Only the statistically significant comparisons are reported in these three tables.

- Completion of six of the 12 tasks was more likely to be expected of subjects who had deployed one or more times.
- Four of the 12 tasks were reported to have been performed more frequently by respondents who had deployed at least once.
- None of the 12B-specific tasks had been performed more frequently by non-deployed subjects.
- No significant differences between the two groups were found on the task importance ratings or the reports of time needed to complete the tasks.
- taking more time to finish then did deployed subjects.

Table 21. Others' expectations of subject task completion: statistically significant chi-squared tests with deployed and non-deployed respondents who completed the common or 12B-specific task JAQ

<u>Task</u>	<u>Deployed</u>		<u>Non-Deployed</u>				<u>Summary</u>
	<u>Percentage Yes</u>	<u>n</u>	<u>Percentage Yes</u>	<u>n</u>	<u>Chi-Squared</u>	<u>p</u>	
Lift and carry H6 Cratering Charges from a stockpile location to an emplacement area	93.7%	553	78.3%	23	8.1	.004	Respondents who deployed were more likely to be expected to perform this task as part of their MOS.
With assistance from another Soldier, lower the Modular-Pack Mine System (MOPMS) from a truck, then lift and carry it to the employment site	75.4%	553	56.5%	23	4.2	.041	Respondents who deployed were more likely to be expected to perform this task.
Pound U-shaped pickets using a picket pounder	96.6%	565	87.5%	24	5.4	.021	Respondents who deployed were more likely to be expected to perform this task.
Carry rolls of concertina wire or barbed wire while constructing obstacles	98.1%	567	83.3%	24	20.2	<.001	Respondents who deployed were more likely to be expected to perform this task.
With the assistance of another Soldier, stretch concertina/barbed wire across pickets and attach with wire ties	97.9%	568	83.3%	24	18.6	<.001	Respondents who deployed were more likely to be expected to perform this task.
Perform grappling with a grappling hook to clear booby traps/antipersonnel devices from an obstacle by throwing the hook, dropping to the ground, and pulling the hook back to your position	91.7%	565	79.2%	24	4.5	.034	Respondents who deployed were more likely to be expected to perform this task.

Table 22. Deployed vs. non-deployed respondents who completed the 12B-specific JAQ task frequencies, task importance, time taken for the task, and supplementary task information

<u>Item Type</u> ¹	<u>Task</u>	<u>Deployed</u>			<u>Non-Deployed</u>			<u>2-tailed p</u>	<u>Summary</u>
		<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>	<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>		
Frequency	Lift and carry H6 Cratering Charges from a stockpile location to an emplacement area	2.6	261.9	503	1.9	156.9	14	.006	More frequently done among respondents who had deployed
	Perform grappling with a grappling hook to clear booby traps/antipersonnel devices from an obstacle by throwing the hook, dropping to the ground, and pulling the hook back to your position	2.8	258.3	495	2.1	163.6	15	.009	More frequently done among respondents who had deployed
	Use a PSS-14 Mine Detector (or similar device) to scan for land mines	3.3	262.6	505	2.2	138.2	13	.002	More frequently done among respondents who had deployed
	With assistance, lift, carry and assemble components of the volcano mine system (i.e., beams, tripod assemblies, launcher racks)	1.5	242.3	460	1.1	169.1	18	.011	More frequently done among respondents who had deployed
Supplementary	When you were involved in building a Bailey bridge, how far did you usually carry the bridge components?	1.6	200.5	374	1.2	153.0	21	.035	Bridge components were carried further by respondents who had deployed.
	When pounding pickets to construct wire obstacles, how many pickets would you usually emplace before resting?	4.6	294.2	556	3.7	189.0	23	.002	More pickets were emplaced before resting by respondents who had deployed.

¹ The following item types were found to have no significant differences: task importance, time to complete

Table 22. Continued¹

<u>Item Type</u>	<u>Task</u>	<u>Deployed</u>			<u>Non-Deployed</u>			<u>2-tailed p</u>	<u>Summary</u>
		<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>	<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>		
Supple- mentary (continued)	When you pounded pickets while constructing wire obstacles, how long would you usually work before resting?	4.7	291.5	553	4.0	215.8	23	.024	Respondents who had deployed usually worked longer before resting when pounding pickets.
	When performing grappling with a grappling hook, how many times did you usually throw the grappling hook before resting?	5.9	261.5	501	4.6	131.5	14	< .001	Respondents who had deployed usually threw the grappling hook more often before resting.
	When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, how far did you usually scan?	4.2	269.2	510	2.8	131.1	18	< .001	Respondents who had deployed usually scanned further for mines and/or IEDs.
	When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, how long did this task usually take?	2.6	261.1	497	1.9	173.7	18	.011	Respondents who had deployed usually scanned longer for mines and/or IEDs.

¹The following item types were found to have no significant differences: task importance, time to complete

Table 23. Statistically significant t-tests: Deployed vs. non-deployed respondents who completed the 12B-specific task JAQ - supplementary information items with open response formats

<u>Item</u>	<u>Deployed</u>			<u>Non-Deployed</u>					
	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>t</u>	<u>2-tailed p</u>	<u>Summary</u>
When carrying H6 cratering charges from the stockpile location to the crater site for emplacement, what is the smallest number of charges you personally carried in a single trip?	1.1	0.6	474	1.0	0.00	11	4.8	< .001	Respondents who deployed had greater minimum numbers of charges carried than respondents who did not
When involved in building a Bailey bridge, what percentage of the time did you carry the Rocking Roller Template or Bridge Bearing by yourself?	12.6	20.8	433	24.2	26.0	24	-2.6	.009	When building a Bailey bridge, respondents who had <u>not</u> deployed carried bridge components by themselves more often than others
When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, what is the shortest distance you scanned (in yards)?	30.2	58.9	481	12.2	10.8	17	4.8	< .001	Respondents who deployed had greater minimum distances scanned than others when scanning for mines and/or IEDs
When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, what's the longest distance you scanned (in yards)?	633.6	1931.0	482	38.3	31.2	17	6.7	< .001	Respondents who deployed had greater maximum distances scanned than others when scanning for mines and/or IEDs
When you scanned for mines and/or IEDs with a PSS-14 Mine Detector or similar device, what is the longest time it took you (in minutes)?	115.5	132.2	472	45.8	34.1	17	2.2	.031	Respondents who deployed had greater maximum times scanned than others when scanning for mines and/or IEDs

Table 23. Continued

<u>Item</u>	<u>Deployed</u>			<u>Non-Deployed</u>					
	<u>Mean</u> <u>n</u>	<u>SD</u>	<u>n</u>	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>t</u>	<u>2-tailed</u> <u>p</u>	<u>Summary</u>
When you scanned for mines and/or IEDs with a PSS_14 Mine Detector or similar device, what's the longest time it took you (in minutes)? When you carried equipment to install the volcano mine system, what is the greatest number of Soldiers who helped you do it?	115.5	132.2	472	45.8	34.1	17	2.2	.031	Respondents who deployed had greater maximum times scanned than others when scanning for mines and/or IEDs
When you carried equipment to install the volcano mine system, what's the smallest number of Soldiers who helped you do it?	2.3	2.0	430	.7	1.5	15	3.0	.003	Respondents who deployed had smaller minimum numbers of Soldiers helping them carry equipment to install the volcano mine system
When you carried equipment to install the volcano mine system, what's the greatest number of Soldiers who helped you do it?	6.1	6.1	430	1.2	2.6	15	3.1	.002	Respondents who deployed had greater maximum numbers of Soldiers helping them carry equipment to install the volcano mine system

7.2. Common Task JAQ

The comparisons of subjects who had deployed at least once to those who had not, on aspects of the common tasks, are reported in Tables 24, 25 and 26. Only the statistically significant comparisons are reported in these three tables.

- Completion of only one of the 15 common tasks (i.e., task #4, throwing a hand grenade) was more likely to be expected of subjects who had deployed one or more times if the situation arose.
- Only one of the common tasks (i.e., task #15 – while seated, removing and lifting or lowering the M242 Feeder Assembly from the 25mm gun on a BFV during maintenance and/or remedial action misfire procedures) was more likely to be expected of subjects who had not deployed.

- Six of the 15 common tasks were reported to have been performed more frequently by respondents who had deployed at least once.
- None of the common tasks were reported to have been performed more frequently by non-deployed subjects.
- Only one of the common tasks (i.e., task #1, lifting and dragging a casualty to a safe location as quickly as possible) was rated as more important to job success by those who had deployed, and none were rated as more important by those who had not deployed.
- The deployed subjects rated only common task #14 (i.e., performing a dismounted foot march or tactical movement) as taking more time to complete than did the subjects who had not deployed.

Table 24. Others' expectations of subject task completion: Statistically significant chi-squared tests with deployed and non-deployed respondents who completed the Common Task JAQ

<u>Task</u>	<u>Deployed</u>		<u>Non-Deployed</u>				
	<u>Percentage Yes</u>	<u>n</u>	<u>Percentage Yes</u>	<u>n</u>	<u>Chi-Squared</u>	<u>p</u>	<u>Summary</u>
Throw a hand grenade	93.8%	243	76.9%	13	5.4	.020	Respondents who deployed were more likely to be expected to throw a hand grenade as part of their MOS
While seated, remove and lift or lower the M242 Feeder Assembly from the 25mm gun on a BFV during maintenance and/or remedial action misfire procedures	51.3%	238	84.6%	13	5.5	.019	Respondents who <i>did not</i> deploy were more likely to be expected to perform this task

Table 25. Deployed vs. non-deployed respondents who completed the Common Task JAQ task frequencies, task importance, time taken: for the task, and supplementary task information

<u>Item Type</u>	<u>Task</u>	<u>Deployed</u>			<u>Non-Deployed</u>			<u>2-tailed p</u>	<u>Summary</u>
		<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>	<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>		
Frequency	With a group of Soldiers, lift, carry and connect a vehicle tow bar for a Buffalo, BFV or Stryker from a towing vehicle to the disabled vehicle	2.8	128.1	240	1.8	63.0	10	.004	More frequently done among respondents who had deployed
	Jack up a vehicle and remove lug nuts from a flat tire	2.0	126.0	238	1.3	70.2	9	.011	More frequently done among respondents who had deployed
	With the assistance of another Soldier, remove a spare tire from a HMMWV, roll into place, and lift onto the axle of the disabled vehicle	1.8	127.0	237	1.3	85.8	12	.033	More frequently done among respondents who had deployed
	Manually tighten the lug nuts on a tire with a lug or torque wrench	2.0	127.4	238	1.4	74.0	11	.007	More frequently done among respondents who had deployed
	As part of a group of four Soldiers, remove the flat tire from a HMMWV, then roll and lift it into the back of a vehicle	1.8	127.9	239	1.3	89.2	12	.044	More frequently done among respondents who had deployed
Importance	Lift and drag a casualty to a safe location as quickly as possible	4.5	129.0	241	4.0	86.3	12	.020	Respondents who had deployed ranked this task as more important than respondents who had not.
Time	As part of a group of four Soldiers, remove the flat tire from a HMMWV, then roll and lift it into the back of a vehicle	2.7	93.2	180	3.4	130.8	9	.033	Respondents who had not deployed ranked this task as taking more time to perform than respondents who had.

¹ Means are inappropriate for this question based on the response options.

Table 25. Continued

<u>Item Type</u>	<u>Task</u>	<u>Deployed</u>			<u>Non-Deployed</u>			<u>2-tailed p</u>	<u>Summary</u>
		<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>	<u>Mean</u>	<u>Mean Rank</u>	<u>n</u>		
Time (continued)	Perform a dismounted foot march or tactical movement	5.7	127.7	239	4.9	92.8	12	.022	Respondents who had deployed ranked this task as taking more time to perform than respondents who had not.
Supplementary	How much weight do you usually carry when performing a dismounted tactical movement of six miles or more? ¹	n/a ¹	123.8	232	n/a ¹	83.2	11	.049	Respondents who had deployed carried more weight during dismounted tactical movements of six miles or more than those who had not.

¹ Means are inappropriate for this question based on the response options.

Table 26. Statistically significant t-tests: Deployed vs. non-deployed respondents who completed the Common Task JAQ - supplementary information items with open response formats

<u>Item</u>	<u>Deployed</u>			<u>Non-Deployed</u>					<u>Summary</u>
	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>t</u>	<u>2-tailed p</u>	
During a typical year in either a garrison or training environment, what percentage of your time is spent loading/unloading supplies and equipment?	7.4	5.9	242	16.2	23.1	13	-4.1	< .001	Respondents who had <u>not</u> deployed spent a greater percentage of their time in garrison and training settings loading and unloading supplies and equipment than those who had.
When you performed a dismounted tactical movement, what is the heaviest load you carried?	91.0	31.6	228	57.7	21.1	11	3.5	0.001	Respondents who had deployed carried more weight than others when performing dismounted tactical movements.
When you performed a dismounted tactical movement of six miles or more, what is the lightest load you carried?	38.2	22.6	223	18.1	13.0	10	2.8	0 .006	Respondents who had <u>not</u> deployed carried lighter minimum loads than others when conducting dismounted tactical movements of six miles or more.
When you performed a dismounted tactical movement of six miles or more, what is the heaviest load you carried?	82.7	31.2	223	57.0	26.6	10	2.6	0.011	Respondents who had deployed carried heavier maximum loads than others when conducting dismounted tactical movements of six miles or more.
During a typical year in either a garrison or training environment, what percentage of your time is spent loading/unloading supplies and equipment?	7.4	5.9	242	16.2	23.1	13	-4.1	<0.001	Respondents who had <u>not</u> deployed spent a greater percentage of their time in garrison and training settings loading and unloading supplies and equipment than those who had.
When you performed a dismounted tactical movement, what is the heaviest load you carried?	91.0	31.6	228	57.7	21.1	11	3.5	0.001	Respondents who had deployed carried more weight than others when performing dismounted tactical movements.

Table 26. Continued

<u>Item</u>	<u>Deployed</u>			<u>Non-Deployed</u>					
	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>Mean</u>	<u>SD</u>	<u>n</u>	<u>t</u>	<u>2-tailed p</u>	<u>Summary</u>
When you performed a dismounted tactical movement of six miles or more, what is the lightest load you carried?	38.2	22.6	223	18.1	13.0	10	2.8	.006	Respondents who had <u>not</u> deployed carried lighter minimum loads than others when conducting dismounted tactical movements of six miles or more.
When you performed a dismounted tactical movement of six miles or more, what is the heaviest load you carried?	82.7	31.2	223	57.0	26.6	10	2.6	.011	Respondents who had deployed carried heavier maximum loads than others when conducting dismounted tactical movements of six miles or more.

Section 8: The Effect of Task Completion Expectations on Task Performance

Task expectations were strongly related to the frequency with which each of the 27 tasks in this study was performed. Task performance expectations were associated with more frequent performance for *all* 27 tasks represented in the two JAQ's administered in this study. These analyses are summarized in Table 27.

Table 27. The effects of task completion expectations on task performance: MOS-specific and common tasks

	<u>Task</u>	<u>r(phi)</u>	<u>Range of r(phi)³</u>	<u>Summary</u>
12B-Specific (3 highest phi's)¹	Pound U-shaped pickets using a picket pounder (n = 546)	.63	.22 - .63	Each of the 12 MOS-specific tasks was more likely to be performed by a Soldier when the Soldier said he was expected to perform that task when the situation arose. This relationship was strongest in the three 12B-specific tasks listed here.
	As part of a six-Soldier team, lift, carry, and emplace a Bailey Bridge (n = 191)	.61		
	Lift and carry the Bailey Bridge Rocking Roller Template or Bridge Bearing by yourself (n = 294)	.58		
Common (3 highest phi's)²	Lift and carry ammunition cans from the supply point (e.g. ammunition center or truck) to the back of a BFV (n = 252)	.64	.22 - .64	Each of the 15 common tasks was more likely to be performed by a Soldier when the Soldier said he was expected to perform that task when the situation arose. This relationship was strongest in the three common tasks listed here.
	With assistance from another Soldier, lift, carry and install the barrel of a 25mm gun onto a BFV (n = 250)	.52		
	Climb over, through, or around barbed wire obstacles (n = 220)	.47		

¹ All p's for these task analyses are significant at the .001 level.

² All p's for these task analyses are significant at the .05 level.

³ The two ranges of r(phi) represent all 12 MOS-specific tasks and all 15 common tasks.

Section 9: The Number of Tasks Performed in the Last Two Years

Based on these survey results, the vast majority of combat engineers had not once in the last two years performed one or more of the tasks addressed -- not even in their initial entry training. For example, 67% said they had not in the last two years removed and lifted or lowered the M242 feeder assembly from the 25mm gun on a BFV during maintenance or remedial action misfire procedures, and 45% said they had not lifted and carried ammunition cans from the supply point to the back of a BFV during the same time period. Thirty-six percent said they had not pulled a casualty from a commander's seat through the top hatch of a vehicle in the last two years, and 30% said they had not in the last two years manually tightened the lug nuts on a tire with a lug or torque wrench. Further, six respondents said they had not performed a dismounted foot march or tactical movement *even once* in the last two years! Perhaps these latter respondents were on medical restrictions (i.e., "profiles") during their IET -- it seems highly unlikely that their training group would not have conducted a tactical movement over their entire training period. The graphs of task performance frequencies in Results Sections 2 and 4 display the data indicating how often each job-specific and common task was done (and not done) in the two years prior to the surveys. However, a notable statistic that these graphs don't show is the total number of these tasks that were performed (and not performed) by respondents in the two prior years.

For both of the JAQ's administered in this study, we conducted an analysis of the number of tasks represented by the survey that each of the respondents performed. Tables 28 and 29 display the numbers of both job-specific and common tasks reported to be performed by combat engineers in the last two years. Tables 28 and 29 indicate that over half the combat engineers completing the 12B-Specific JAQ (i.e., 52.1%) performed only seven or fewer of the 12 job-specific tasks represented by the questionnaire, and over a quarter of the combat engineers completing the Common Task JAQ (i.e., 26.7%) performed only eight or fewer of the 15 common tasks represented by that survey. Thus it appears that among combat engineers, a large percentage of the respondents have not even once in the last two years performed many of the tasks represented in the JAQ's administered in this study.

Table 28. The number of job-specific tasks performed by combat engineers in the last two years

<u>Number of Tasks</u>	<u>Number of Respondents</u>	<u>Percentage</u>	<u>Cumulative Percentage</u>
0	9	1.5	1.5
1	4	0.7	2.2
2	6	1.0	3.2
3	9	1.5	4.7
4	27	4.5	9.2
5	55	9.2	18.5
6	96	16.1	34.6
7	104	17.5	52.1
8	95	16.0	68.1
9	82	13.8	81.8
10	49	8.2	90.1
11	37	6.2	96.3
12	22	3.7	100
Total	595	100	

Table 29. The number of common tasks performed by combat engineers in the last two years

<u>Number of Tasks</u>	<u>Number of Respondents</u>	<u>Percentage</u>	<u>Cumulative Percentage</u>
0	2	0.8	0.8
2	1	0.4	1.2
3	3	1.2	2.3
4	5	1.9	4.3
5	7	2.7	7.0
6	13	5.0	12.0
7	17	6.6	18.6
8	21	8.1	26.7
9	17	6.6	33.3
10	23	8.9	42.2
11	39	15.1	57.4
12	44	17.1	74.4
13	22	8.5	82.9
14	25	9.7	92.6
15	19	7.4	100
Total	258	100	

Section 10: Deployed Soldiers Who Performed MOS-Specific Tasks in the Field but Not in Garrison

A number of combat engineers who had deployed at least once said that they had performed MOS-specific tasks in the field *but not in garrison*. Among the 553 combat engineers who said they had deployed in two questions on the 12B-Specific JAQ and also performed one or more MOS-specific tasks in the prior two years, 34 (6.1% of these deployed respondents) reported not having performed any of these tasks in a garrison setting. Seven of these 34 respondents (20.6% of this small sample) said they performed these MOS-specific tasks over 75% of the time during their last deployment. Table 30 displays the amounts of time spent by these respondents performing MOS-specific tasks during their last combat deployment.

Table 30. Percentage of time spent performing job-specific tasks during their last deployment by combat engineers who had not performed these tasks in garrison

<u>Percentage of Time Spent</u>	<u>Number of Respondents¹</u>	<u>Percentage</u>
Less than 25%	22	64.7
26 – 50%	3	8.8
51 – 75%	2	5.9
Over 75%	7	20.6
Total	34	100

¹Slightly over six percent (i.e., 6.1%) of 553 deployed combat engineers are represented in this table.

Section 11: Comparisons of JAQ Ratings to Judgments of SMEs

As part of the larger study conducted with TRADOC to develop physical performance standards for the Army's most physically demanding jobs, researchers from USARIEM obtained information on the critical tasks performed by combat engineers from 20 SMEs. These SMEs had served in several capacities in relation to the MOS's being addressed (e.g., officers, warrant officers or non-commissioned officers in the MOS for at least 12 of the past 24 months and deployed within the past 24 to 36 months; some also serving as battalion- and/or company-level leaders). When asked to identify the critical physically-demanding tasks of the combat engineer MOS, they selected the following 12 tasks:

- Performing a dismounted tactical movement
- Dragging a casualty to a safe location
- Evacuating a casualty from the top of a vehicle
- Using a hand grenade
- Filling and carrying sandbags to prepare a fighting position
- Removing a feeder assembly from a BFV
- Loading ammunition cans onto a BFV
- Carrying an APOBS
- Lifting and carrying cratering charges

- Lifting and carrying the MOPMS
- Assembling a Bailey bridge
- Assembling a volcano mine system.

Similarities and differences were noted between the combat engineer tasks selected as critical by the SME's and those rated as highly important by the combat engineers completing the JAQ. The JAQ importance scale ranges from 1 ("of little importance") to 5 ("extremely important"). Of the tasks selected by the SME's, those also rated high in importance on the JAQ were dragging a casualty to a safe location (mean of 4.44), performing a dismounted tactical movement (mean = 4.41), and evacuating a casualty from the top of a vehicle (mean = 4.33). However, several tasks selected as critical by the SME's were not rated highly in importance by the JAQ respondents. These included the three listed tasks involved with building a Bailey bridge (means on the JAQ = 2.28, 2.39 and 2.42), lifting and carrying the MOPMS (mean = 3.04), assembling a volcano mine system (mean = 3.18), and carrying the APOBS (mean = 3.18). Further, some tasks rated high in importance on the JAQ were not even selected as critical by the SME's. These tasks were: Scanning for land mines (JAQ mean = 4.21), carrying a tow bar from a towing vehicle and connecting it to a disabled vehicle (mean = 4.13), grappling with a grappling hook to clear booby traps (mean = 4.01), and all three of the listed tasks involved with installing obstacles of concertina or barbed wire (means = 4.14, 4.13 and 4.08).

When comparing task importance ratings of the JAQ respondents to those tasks rated as critical by the SMEs, it's important to note that respondents to the questionnaire were specifically instructed that not all tasks can be extremely important. Nonetheless, it appears that many Soldiers performing as Army combat engineers have fairly substantial differences of opinion concerning what tasks are important in their MOS than do those developing doctrine and training programs for the combat engineer MOS. Several tasks not identified as critical by the SMEs (e.g., scanning for land mines, pounding pickets, grappling to clear booby traps) were rated high in importance on the JAQ, thus in a sense validating their

inclusion on the questionnaire. It also appears that the frequency with which a task is performed is more closely related to its rated importance among combat engineers than among the SMEs. For example, assembling the Bailey bridge and the volcano mine system were tasks that were reported as very infrequently done by the combat engineers. Whereas these engineers rated these tasks as relatively not very important, the SMEs rated these tasks as “critical” to the 12B MOS. (It’s important to note here that combat engineers were specifically instructed in the two JAQ’s not to base their importance ratings on how often they performed the task.) Other tasks rated as critical by the SMEs that were rated as not frequently conducted by JAQ respondents were carrying an APOBS, removing a feeder assembly from a BFV, and lifting and carrying the MOPMS.

Section 12: Comments Provided on the JAQ

Part of the purpose of this research investigation was to ascertain if there are any physically demanding jobs performed by combat engineers that we failed to identify (see Table 31). Three broad task areas were frequently mentioned: 1) Carrying equipment not mentioned in the survey (e.g., the bangalore, the mine clearing line charge (MICLIC), and the Thor III), 2) route clearance using some of the same equipment (i.e., the bangalore and the MICLIC), and 3) breaching obstacles using some of the same equipment along with other tools. Further research is needed to explore whether task simulations for these three general task areas should be included in a set of assessment tools being developed to predict performance in the combat engineer MOS.

Table 31. Summary of comments provided on the two JAQ's completed by combat engineers

<u>Topic Addressed</u>	<u>Number of Comments (Not all represented)</u>
Breaching Obstacles	64
Dismounted Patrols (Addressed in the JAQ's)	49
Route Clearance	33
The Bangalor (Carrying or using for breaching)	27
The Mine Clearing Line Charge (MICLIC)	21
Changing or breaking track (Addressed in the JAQ's)	18
The THOR	15
Digging	8
The Goldie	6
The Minehound	4
All Valid Comments	266
<i>316 "Irrelevant" responses</i>	

Discussion

The purpose of this survey project was to gather various types of job-related information pertaining to the Army combat engineer position (MOS 12B) from job incumbents. This information will be used to develop physical performance standards for the 12B position, with a view toward identifying and implementing task simulation tools that are effective in predicting performance on a subset of the tasks performed by combat engineers.

Most Frequently Performed and Most Important Tasks

The tasks reported by JAQ respondents as the most frequently performed, and those that were rated as most important, are specified in this report. The more frequently performed tasks were conducting dismounted foot marches and tactical movements, tasks centering on constructing concertina wire or barbed wire obstacles, scanning for land mines using appropriate equipment (e.g., the PSS-14 Mine Scanner), and lifting and dragging casualties to safe locations as quickly as possible. The tasks rated as more important to success in the combat engineer MOS were quickly lifting and dragging casualties to safe locations, conducting dismounted foot marches and tactical movements, tasks centering on constructing concertina wire or barbed wire obstacles, and scanning for land mines using appropriate equipment.

The tasks rated as most important to job success are to a large extent those reported as the most frequently performed. However, two of the common tasks were reported as being more important but less frequently done. These tasks were: 1) With assistance from another Soldier, lift, carry, and install the barrel of a 25mm gun onto a BFV; and 2) with the assistance of another Soldier, pull a casualty from a commander's seat and through the top hatch of a vehicle (i.e., BFV or Stryker). A third common task, using a shovel or entrenching tool to fill sand bags when preparing to build a fighting position, was rated as being less important but more frequently done.

Comparing Task Performance in Garrison and Combat Settings

It appears there are several important tasks inherent to the combat engineer MOS that are, as a whole, performed more often during combat deployments than in garrison or training settings. For example, it was reported that while tactical marches and patrols were conducted nearly 20% of the time during combat deployments, they were performed only about half as often in garrison and training settings. Combat engineering tasks were indicated as being performed 17.3% of the time during deployments but only 12.3% of the time in garrison and training - an over 40% greater amount of time in combat settings. This last difference may not appear large, but it may be significant for training programs. These findings are underscored by comparing the task performance of respondents who had deployed to that of respondents who had not. Those who had deployed reported more often pulling casualties from commander's seats through the tops of vehicles (rated as one of the most important common tasks), using grappling hooks to clear booby traps, and using a PSS-14 Mine Detector or similar device to scan for land mines (while scanning for far greater distances and lengths of time). They also indicated carrying more weight during dismounted tactical movements of six miles or more - at times nearly 50% more weight than their counterparts who had not deployed. It is possible there are specific training strategies that account for most or all of these differences in task emphasis across settings (e.g., the findings pertaining to dismounted tactical movements and patrols across settings may reflect a desire on the part of trainers not to overly strain or injure troops by high amounts of exceedingly-demanding physical work in settings other than combat). However, these differences highlight a potential need to review training programs focused on preparing Soldiers in the 12B MOS for performance in combat theaters.

Performance Expectations and Task Performance

Expectations of task completion were found to be strongly associated with how often Soldiers performed the tasks represented in this study. Each of both the 12B-specific and common tasks was reported to have been performed more often by Soldiers when they knew they were expected to perform the task when the situation arises. Results indicated that for each task, there was a small to significant percentage of Soldiers who did not believe they were expected to perform the task when needed. Perhaps

for some of these Soldiers, there are good reasons to believe that one or more of the tasks represented in either of the two surveys they completed for this study are not part of their jobs. However, the belief these Soldiers have that they are not expected to complete certain specific tasks when the situation arises may well reflect on the training they receive. This belief may also be held by respondents who have never performed these tasks in either garrison or deployment settings.

The Number of Tasks Performed

Based on these survey results, a large percentage of combat engineers reported that they had not once completed certain tasks in the last two years. Further, a subset of these engineers had not performed some of the tasks addressed in the Common Task JAQ in their initial entry training. These results may be partially or fully explained by the fact that a substantial majority of these subjects (i.e., over 85%) had obtained the rank of E5 or higher, and thus may have delegated many of these tasks. These results may also be largely explained if the base or bases these subjects were assigned to in the last two years did not have some or all of the needed equipment located there. Nonetheless – overall, over half the combat engineers completing the 12B-Specific JAQ performed only seven or fewer of the 12 job-specific tasks represented by that questionnaire, and over a quarter of the combat engineers completing the Common Task JAQ performed only eight or fewer of the 15 common tasks represented by that survey. It is important to point out that the provided results reflect only those persons who completed the surveys. It is possible that those participants were in some respects not representative of the broader group of 12B personnel. This possibility appears fairly likely given that response rates to the 12B-Specific and Common Task JAQ's were 9.2% and 3.8% respectively.

Tasks Performed in Combat Settings but Not in Garrison

Several Soldiers who had been deployed said that they had performed combat engineering tasks in the field *but not in garrison*. Thus, it appears that these Soldiers completed at least some combat engineering tasks during their deployment that they had not recently been trained to perform in garrison settings. This may be cause for concern. Thirty-four respondents in the sample indicated that they had

been deployed at least once and had performed combat engineering tasks (obstacle breaching, emplacing and clearing obstacles, building bridges, etc.) in combat settings but not in garrison. Of these 34 respondents, 12 of them (35% of this small sample) reported that they had performed combat engineering tasks at least 25% of the time they had been deployed, and seven reported performing these types of tasks over 75% of the time during their deployment. The other 22 indicated that they completed combat engineering tasks less than 25% of the time they were deployed. Thus, it appears that they also occasionally completed combat engineering tasks during their deployment that they had not recently been trained to perform in garrison settings.

Comparing Task Importance Ratings of Soldiers to Those of SMEs

A comparison of the task importance ratings of the JAQ respondents with the judgments of 20 SMEs revealed more differences than similarities. The combat engineers and SMEs agreed on the high importance of three of the tasks (i.e., dragging a casualty to safety, performing dismounted tactical movements, and evacuating a casualty from the top of a vehicle), and came fairly close to agreement on others (e.g., lifting and carrying cratering charges, loading ammunition cans onto a BFV, throwing a hand grenade). However, the SMEs saw several tasks as critical that the engineers rated as far less important (i.e., building a Bailey bridge, lifting and carrying the MOPMS, assembling a volcano mine system, and carrying the APOBS). Perhaps most notably, some tasks were rated as highly important by the engineers but not selected as critical by the SMEs (i.e., scanning for land mines, carrying a tow bar and connecting it to a disabled vehicle, grappling to clear booby traps, and all three of the listed tasks involved with installing obstacles of concertina or barbed wire).

What are some implications of these comparisons? First, it appears that some tasks that were once important to the job of a combat engineer (e.g., constructing a Bailey bridge, assembling a volcano mine system, carrying the APOBS) may still be thought of as important to this job by SME but not by job incumbents. Thus, differences of perspective concerning the relative importance of tasks performed by 12B's may lead to large differences in the manner that experts think the combat engineer job should be

performed and the way it's actually prepared for and performed by incumbents. For example, perhaps the volcano, APOBS, or other effective tools or equipment would be set aside and other equipment used. This may happen because some of this equipment may not be used in current combat scenarios, because Soldiers do not believe it's the best equipment available for the task, or because they are unaware that such equipment exists. Some of these possibilities may reflect a lack of knowledge and experience on the part of incumbent Soldiers that SMEs often possess, and these possibilities can be addressed in training settings and scenarios. As another example, large amounts of time might be spent performing grappling or mine-scanning tasks that Soldiers view as critical but experts see as excessive. Further, it would be entirely possible to select a set of physically demanding tasks that are approved by experts for assessing Soldiers for the 12B position that are widely or consistently used by job incumbents or others for screening purposes.

Tasks Not Addressed by JAQ's but Mentioned by Soldiers

Part of the purpose of this research investigation was to ascertain whether there were any physically demanding tasks performed by combat engineers that those conducting this research failed to identify (see Table 31). Three broad task areas were frequently mentioned: 1) Carrying equipment not mentioned in the surveys such as the bangalore, the mine clearing line charge (MICLIC), and the Thor III, 2) route clearance using some of the same equipment (i.e., the bangalore and the MICLIC), and 3) breaching obstacles using some of the same equipment along with other tools. Further research is needed to explore whether task simulations for these three general task areas should be included in a set of assessment tools being developed to predict performance in the combat engineer MOS.

Questionnaires and surveys are by their very nature slow and time-consuming methods of information collection. The entire process of survey research design, survey preparation, distribution, completion, data analysis, report preparation, and distribution of findings may span months or even years. Job analysis using such methods can obtain accurate and helpful information, but it is possible that during the time required to conclude the survey process the jobs being analyzed may change to a considerable

extent. It is quite possible that the combat engineer MOS being addressed in this report may have changed to some degree during the survey process, and may now contain a number of aspects not originally identified in this study. These aspects may need to be considered and addressed during the process of developing proxy measures for selection, as well as during the process of upgrading the appropriate training programs. It is also recommended that a similar task analysis be conducted on at least a periodic basis (perhaps every five years) in order to update training doctrine to reflect ongoing operational needs.

Strengths and Limitations of this Research

The two survey studies discussed in this report were designed with the following strengths.

- 1) The surveys used in this research were designed using best practices for survey development, including the writing and scaling of items based on the combined experience of 20 SMEs and observations of job performance conducted by several research scientists. Many item response sets were quantified as appropriate, and supplemental items were used to gather qualitative information concerning many of the tasks.
- 2) The entire population of Army combat engineers (8,175 Soldiers) was provided the opportunity to respond to the surveys, rather than only a sample of these Soldiers.
- 3) Survey content was distributed over two surveys, to increase the number of fully completed surveys and the focused attention of Soldiers while completing them.
- 4) Surveys were administered by computer to maximize sample size, ease of use, and ease of data compilation and transfer.

This research is also limited in the following ways:

- 1) The response rates in this research were low (i.e., 9.2% for the MOS-specific JAQ and 3.8% for the Common Task JAQ). Thus, there may be a moderate to high likelihood that some results do not well represent the combat engineer population as a whole. Further, those conducting this research had no way to compare respondents to non-respondents.

- 2) Despite the customization of many items to the combat engineer MOS, a large percentage of the JAQ items were of necessity written generically to ensure comparability of responses from Soldiers in many Army MOS's. This may have affected the quality of some item responses.
- 3) This survey was web-administered, and thus participants had limited opportunity to seek feedback about question intent. This may have affected the appropriateness of some item responses. For example, participants may have overlooked the units of distance being asked and thus responded in feet or yards when the unit being requested was miles. Task importance ratings were made on the following unanchored scale: "Very little importance" to the performance of my MOS, "Some importance," "Important," "Very important," and "Extremely important." Thus, these response options may represent different meanings or levels of importance to different subjects.

Recommendations

A maxim and doctrinal summary statement often put forward in Army training settings is that the Army should "train as it fights." The results from these two JAQ studies of well over 600 Soldiers in the combat engineer MOS (the total number depending on the number of respondents who completed both surveys) suggest that combat engineers do not always train as they fight. Based on the results, three major recommendations are suggested:

- 1) Regular standardized assessments of combat engineer training programs could be conducted to determine what common and 12B-specific tasks and capabilities will be emphasized or downplayed to reflect actual performance in current combat settings. As force size changes and enemies are encountered in different theaters of operation, changes in training programs may be needed. The extent to which various tasks are performed in theater often changes, and thus the degree to which these tasks are emphasized in training programs may also need to change. Information pertaining to task participation could be gathered from recently deployed Soldiers, and lessons learned could be used to identify the physically demanding tasks that are more important and frequently performed.

- 2) More training time may be needed to perform certain tasks in garrison settings. For example, based on this survey data, tactical marches and patrols are being performed nearly twice as often in theater as they are in garrison and training settings. Further, a large percentage (i.e., 36%) of the respondents said that they had never pulled a casualty from a commander's seat through the top hatch of a vehicle, despite the fact that this was rated one of the most important tasks to job success. On a more general level, the vast majority of respondents (over 96% of the 12B-specific JAQ respondents and over 92% of those completing the Common Task JAQ) said that in the last two years they had not performed one or more of the 27 tasks represented in this study. Over 68% (i.e., over two out of three) of the respondents to the 12B-specific JAQ said they had not performed four or more of the 12 listed combat engineer tasks within the past two years, and over 42% (i.e., over two out of five) of the 12B participants completing the Common Task JAQ said they had not done five or more of the 15 listed common tasks within the same timeframe.
- 3) A dedicated follow-up effort is recommended to ascertain that Soldiers are trained on each of these critical tasks. The percentages of JAQ respondents who reported in the last two years that they had not performed one of the 12 tasks evaluated by SMEs as critical to the 12B MOS ranged from 2% (not completing a dismounted tactical movement) to 67% (not helping to lift and carry the MOPMS to an employment site).

